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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1896.

Mo. Bot. Garden,
1897.

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Rosellinia radiciperda, Massee.

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 109.] JANUARY. [1896.

CCCCXCIV.—ROOT DISEASES CAUSED BY FUNGI.

Amongst the numerous root diseases of various plants caused by parasitic fungi, none are better known, or extending over a greater area than the Pourridié of the French, which occurs in France, Italy, Switzerland, Austria, South-West Germany, and has recently been recorded from three widely separated localities in Britain. The fungus causing this disease is called *Dematophora necatrix*, Hartig, which frequently devastates vineyards and orchards; its attacks, however, are unfortunately not confined to vines and fruit trees; potatoes, beans, beet, &c., are also destroyed, and Hartig states that the mycelium soon kills young maples, oaks, beeches, pines, and spruces.

The mycelium first attacks and kills the youngest rootlets, and then enters into the larger branches of the root, in which it rapidly spreads and forms an irregular network of slender strands; finally bursting through the cortex and enveloping the roots in a snow-white, fluffy mycelium, here and there, running into slender cord-like strands, which traverse the soil, and by this means spreads from one tree to another. At a later stage of development, numerous minute, black compact masses of mycelium or sclerotia are formed in the cortex of the roots, and from each of these spring several slender spines, each of which bears an abundant crop of conidia or reproductive bodies at its tip. In addition to the white mycelium, a very characteristic pale brown or olive mycelium is also present on the surface of the roots, formed of septate or jointed threads of variable thickness, having pear-shaped swellings at intervals; these swollen portions finally become free by the disappearance of the intermediate portions of the mycelium, and form bodies capable of germinating and giving origin to a new crop of mycelium. Under certain conditions some of the sclerotia, instead of producing the spine-like bodies bearing conidia, become converted into hollow spheres or pycnidia, containing in their interior numerous minute reproductive bodies or stylospores which germinate at once and produce new plants. Finally, the highest, or ascigerous form of fruit is rare, and only develops on old trunks that have been dead and decayed for a long time. Up to the present the last-mentioned form of fruit has only been met with in France, and its structure is such that the fungus proves to belong to the *Tuberacei* or truffle family.

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Dematophora necatrix is almost entirely confined to heavy clay soils, where the water drains away with difficulty, whereas *Dematophora glomerata*, Viala, an allied, but much rarer fungus, with a similar destructive habit, hitherto observed only in France, is met with attacking plants growing in loose sandy soil, where the subsoil is wet.

During the spring of the present year, a sample of soil was received by the Royal Horticultural Society from Mr. Hooper, Cambridge, Waikato, New Zealand, containing roots of apple trees attacked by a fungus, with a communication stating that the roots of fruit trees which penetrated the places where the fungus appeared to reside became infected, the fungus penetrating the tree and ultimately killing it. This material was forwarded to Kew for investigation. Sterile mycelium alone was present, which appeared to agree in every detail with that of *Dematophora necatrix*, and the fungus was provisionally referred to that species in a brief report published in the Journal of the Royal Horticultural Society (xix., part I., 28). The following account will give an idea of the injury caused by this fungus, as observed by Mr. R. Allan Wight, of Aukland, New Zealand* :—

"This fungus, in the mycelial stage, attacks a great variety of tree roots, amongst the most conspicuous of which are the apple, pear, peach, and all other common orchard trees. The whitethorn is also very subject to its attacks, as well as a great many *Abies*, and several of the native trees and plants. It also attacks the cabbage, the potato, docks, sorrel, fern, and in fact is almost omnivorous, which is a marked peculiarity. The only plants I have ever known to resist it are the resinous pines and roses; the former suffer at first, and the leaves turn yellow, but they ultimately recover, and I never knew one to succumb, whereas the contrary is the case with all other plants attacked."

"In hedges of whitethorn, where roses have been planted at intervals, the thorns are killed and the roses remain intact and quite uninjured. In an orchard it will appear in patches, killing the fern and sorrel, and spreading until it reaches a fruit tree; it then attacks the bark round the stem just under the ground, which speedily rots, presenting the appearance of having been cooked, and has an offensive smell; it then proceeds along the roots, and the tree soon shows withered leaves, which drop off, leaving it bare; and by and by it falls over and lies on the ground. Its movements are uncertain; sometimes a tree here and there dies; sometimes a whole row, and very often acres are swept off. Many entire orchards of fine trees are killed in a few years. This fungus is never found in clay or other damp soils, but always in very friable lands Professor Kirk, of Wellington, says it is *Lycoperdon gemmatum*, Batsch., and that "tar water" is a certain cure. The last statement is assuredly an error, and I think the first is also. For a great many years I have endeavoured in vain to procure the fruit of this fungus, using all the means that suggested themselves to me, without any success. I have seen large quantities of the *L. gemmatum* growing in orchards where there is no root fungus, and I have seen a very great many orchards, and watched several closely where hundreds of trees are attacked, and could never find the mycelium connected with the *Lycoperdon*."

"The pest is most plentiful on the skirts of the primeval forests and on fern lands adjoining where no cultivation has ever been resorted to. Whole crops of potatoes are destroyed on such lands, and on dry lands where native tree stumps remain it is very prevalent. My own opinion is that it is a fungus native to, and probably peculiar to, New Zealand

* Journ. Mycol. Vol. v., p. 199.

(in the North Island only). All my experiments with sulphur and lime have failed. Kerosine oil used in winter has alone been of any use, and that has been used pure in winter without killing the trees. The fungi of New Zealand are legion, and very destructive, but this is the worst, and particularly as it is confined to dry soils. Where I am now writing 500 trees have been killed within the last two years, and all remedies tried have failed. The apple scab, the shot-hole fungus, the oidium of the vine are terrible pests in New Zealand, and the settlers have more to fear from fungus growths than insect pests."

As previously stated, the material received from New Zealand was, in the first instance, referred to *Dematophora necatrix*. Further development of the fungus, and the receipt of additional fruiting specimens from the same country, showed that this was a mistake, neither does the fungus belong to any known species. It will, therefore, be described as new, under the name *Rosellinia radiciperda*. On arrival, the diseased roots and infected soil were permeated throughout with delicate white strands of mycelium. The roots were laid on the surface of a thin layer of sterilized leaf-mould kept moist and protected by a bell-jar. Two boxes, each about one foot square and six inches deep, were filled to within an inch of the top with sterilized leaf-mould. A thin layer of the infected soil was sprinkled on the surface of the soil in each box; in addition, a portion of the root of an "Orange Pippin" apple tree was thrust into the soil of one box, and two beech seedlings planted in the other. Finally the boxes were covered with glass to prevent contamination from floating spores of fungi, kept damp, and placed at the foot of a wall having an eastern aspect, where they remained from June till the end of August. At the end of a month, the roots under the bell-jar, were densely covered with a snow-white fluffy mycelium, giving off numerous delicate white strands which spread into the leaf-mould. By degrees the mycelium on the roots gradually changed to a pale brown colour, and under the microscope the strands of mycelium showed pear-shaped swellings at intervals—hitherto considered as characteristic of *Dematophora necatrix*—represented on the plate, fig. 7. Viala states that in *D. necatrix* these swollen portions gradually become globose and free, if the mycelium is kept very wet, and form reproductive bodies—chlamydospores—capable of germinating and producing new mycelium. I was not successful in producing this result with the mycelium of the New Zealand fungus, although presumably, from analogy, this failure may be due to a lack of some essential factor. At a still later stage, numerous minute sclerotia burst through the cortex of the roots, which in course of time bore clusters of erect stems, each composed of a fascicle of parallel hyphæ, which bear conidia at their much-branched tips, as represented in figs. 8, 9, 10. Scattered at intervals amongst the sclerotia were minute black bodies, which proved to be a second form of fruit, known as pycnidia, and containing minute spore-like bodies—stylospores—in their interior, (figs. 11, 12). The stylospores germinated and produced a delicate mycelium within twenty-four hours when sown in pure water. The same is true of the conidia previously mentioned. The highest or ascigerous condition of fruit was not produced on the roots, owing probably to their disintegrated condition, a more durable matrix being essential for its development. During the period of this investigation, a parcel of New Zealand fungi, collected and communicated by W. Colenso, M.A., F.R.S., was received at Kew, and amongst the number was a species of *Rosellinia*, marked "at the base of a fallen and decayed apple tree." Careful examination of this specimen revealed

the presence of sclerotia bearing conidia identical with those of the fungus under consideration, mixed with the perithecia or ascigerous condition of Colenso's specimen, figs. 1–6, and further, it appears that the perithecia originate from the sclerotia, which previously bear the conidial form of reproduction.

Regarding the boxes previously mentioned it is only necessary to state that the mycelium spread through the leaf-mould, and also attacked the apple tree root and the seedling beeches.

At the close of the experiments, all the material, with the exception of microscopic preparations, was carefully destroyed by burning.

Preventive Measures.

Notwithstanding the fact that the New Zealand fungus proves to be distinct from the European root fungus, yet the general habit, mode of attack, and structure of the two are so similar, that the same methods of combatting the disease will apply to both.

Owing to the habit of the fungus in penetrating and spreading in the living tissues of the root of its victim, cure is practically outside the question when a plant is once permeated with mycelium; and keeping in view the varied modes of reproduction for facilitating the rapid spread of the disease, no efforts should be spared in the way of preventing such spreading, when the presence of the fungus is once detected.

Undoubtedly the most frequent and rapid mode of spreading is by means of the mycelium travelling in the soil, and a good method of isolating diseased patches is to cut a narrow trench, from nine inches to a foot deep round such, care being taken to throw the excavated soil into the diseased portion, and not outside it. This method, which was first suggested by Hartig, for the purpose of preventing the spread of subterranean fungi in the German forests, cannot be too strongly commended, especially where the diseased patches are small in area. The amount of success depends entirely on the thoroughness, combined with an intelligent method of carrying out the work. Half attempts invariably result in a loss of capital without benefit. It may be enough to suggest that the disease may be spread by the spores of the fungus, or infected soil being carried by the shoes of labourers, by dirty tools, wheels of carts, animals, &c. from diseased centres. Diseased and fallen trees, and especially stumps and roots, should be at once destroyed by burning. The soil surrounding diseased stumps should be burned after the stumps have been removod, so as to destroy the smaller diseased portions of the root that remained behind.

A second preventive method, which has proved of service in France, is to lay bare the trunk as far below the surface of the soil as can be done without injury to the tree, and to densely coat the exposed trunk and adjoining soil with powdered sulphur. This should be repeated when the channel round the trunk becomes filled up with earth. If, as stated by Mr. Wight, the New Zealand fungus first attacks the trunk just below the surface of the soil, this method should prove beneficial if persevered with.

Stagnant water should not be allowed to remain in the soil, as this favours the spread of the fungus.

Finally, in those cases where the fungus has completely devastated large areas, it is probable that such will be deserted as unprofitable, the trees being allowed to lie and rot, and the fungus to spread in the soil. This is disastrous, being in fact a nursery for the development and

diffusion of the enemy. It is not the object of this note to suggest whose business it is to prevent such shortsightedness, but to impress emphatically that such a condition of things should not be tolerated.

GEO. MASSEE.

DESCRIPTION of the FIGURES, all of which illustrate *Rosellinia radiciperda.*

Fig. 1, Ascigerous condition of the fungus, showing the perithecia natural size.

Fig. 2, perithecia enlarged.

Fig. 3, section of same, showing the wall to consist of two separate layers, enlarged.

Fig. 4, ascus containing spores, and paraphyses, × 400.

Fig. 5, tip of ascus after treatment with a solution of iodine, showing the arrangement for effecting the opening or dehiscence of the ascus for the escape of the spores, × 400.

Fig. 6, spores from an ascus, one of which is germinating, × 650.

Fig. 7, brown mycelium with swellings at intervals, × 500.

Fig. 8, a black sclerotium bursting through the cortex of a root, from which springs several slender branches bearing conidia, × 50.

Fig. 9, a single thread composing the branches, branched and bearing conidia at the tip, × 400.

Fig. 10, free conidia, × 400.

Fig. 11, a pycnidium springing from the olive mycelium, enlarged.

Fig. 12, stylospores or reproductive bodies produced in the interior of the pycnidia, × 400.

CCCCXCV.—GREAT FROST OF 1895.

The effects of a severe frost on a garden cannot be estimated immediately. Species which at first sight seem irretrievably injured recover in the most surprising manner, or at any rate send up a new growth from the roots. It is prudent therefore not to be hasty in either cutting in or removing plants which seem to have been more or less killed. On the other hand, some which at first sight seem little injured subsequently succumb. Nor is it easy to predict beforehand how any given species will stand the ordeal. In a large collection a severe winter affords many subsequent surprises. Plants which ought to be tender prove unexpectedly hardy; others which ought to be hardy turn out very much the reverse. But the results of no one winter can be taken as absolute; they are largely dependent on the amount of heat which the plants have experienced in the preceding summer. Where the wood has been well ripened they will stand an amount of cold which under other circumstances would be fatal.

At the end of the summer succeeding a severe winter it is possible to estimate the mischief which has occurred. This has now been done at Kew, and the following notes give the results. The labour of compiling a list showing the effects of the frost on individual species would have been greater than any useful result which could have been derived from it. A brief review has only therefore been attempted in general terms.

The period of severe cold began on January 26, when the minimum temperature taken in the screen fell below freezing point and never rose above it till February 22.

During this period a series of extremely low minimum temperatures on the grass was recorded. On January 23, 15°; January 29, 10°; February 7, 1°; February 8, 2°; February 9, 3°; February 12, 5°.

An extreme minimum seems usually to occur every winter between Christmas and the early part of February. The peculiarity of 1895 was its repeated occurrence during a period of nearly a month.

Before placing such remarkable temperatures on record it seemed desirable to check the performance of the instruments used by comparison with the observations taken at the Kew Observatory (Richmond), which is situated in the Old Deer Park and to the south-west of the Royal Gardens.

Mr. Chree, the superintendent, was so good as to take out the lowest temperatures observed at the Kew Observatory from 1888, and in the following table these are compared with the temperatures recorded for the same dates at the Royal Gardens. It will be seen that the two series are fairly accordant, especially for the later years.

LOWEST READINGS from MINIMUM THERMOMETER on GRASS.

Year.	Date.	Observatory.	Royal Gardens.
		° Fahr.	° Fahr.
1888 - - -	February 2 - -	14·1	10
1889 - - -	„ 13 - -	8·8	2
1890 - - -	December 23 - -	7	4
1891 - - -	January 10 - -	9	8
1892 - - -	December 27 - -	9	9 (Feb. 17, 6·5)
1893 - - -	January 5 - -	7	7
1894 - - -	„ 5 - -	11	11
1895 - - -	February 8 - -	0	2 (Feb. 7, 1)

From the gardening point of view the effect of the prolonged low temperature would operate in two ways. Trees and woody plants generally would be liable to be killed by the freezing of their stems and branches. But these and herbaceous plants generally would have also to encounter the effects of the prolonged freezing of the ground surrounding their roots. The subsoil of Kew is for the most part a scarcely coherent sand, which retains little moisture. It was, however, frozen throughout to a depth, in one case under a gravel path, of 2 ft. 10 ins.; under grass the frost penetrated much less, probably only to an average of 20 inches. The fate of the immense and valuable collection of bulbs which had been planted out in the preceding autumn was a matter of the greatest anxiety. On the whole, though all must certainly have been frozen, the loss was less than might have been expected. The destruction of Alpine plants by cold at first sight seems paradoxical. But it must be remembered that in the Alps they are covered by a deep and warm investment of snow, which they rarely receive in England.

Besides the fate of the collections in the open air, the supply of water to those under glass, of which there are 2½ acres, was an even

greater matter of anxiety. The Royal Gardens fortunately possess their own waterworks, which are supplied directly from the Thames. The use of this water for drinking purposes is, however, prohibited by law. The drinking fountains, official residences and those belonging to the Crown, including Kew Palace, are therefore supplied by the Southwark and Vauxhall Company. On February 6 the supply from this source failed, and was not finally restored till April 30 following. For some days no drinking water was obtainable in the whole parish. It is entirely due to the indefatigable exertions made by Mr. Justin Allen, the resident assistant clerk of the works, that a similar disaster did not befall the water service of the Royal Gardens. The mains, of which there are some miles, extend to the high level reservoir in Richmond Park. By the continuous use of steam power the water in these was kept in motion, and in no single case did it freeze. By the aid of the official fire brigade the cisterns of the residences were kept filled, the consumers being warned that the water must be boiled before being used for drinking purposes.

Bulbs, &c.—The spring of 1895 will long be remembered as a particularly fatal one to many kinds of bulbs. All the narcissi of the *Tazetta* section were killed, and even some of the trumpet daffodils suffered a good deal; *maximus*, for instance, was quite killed, and this beautiful form fared no better in a large bulb-growing establishment in the neighbourhood. When taking up the ripened narcissus bulbs it was noticed that their quality was below the average; this was, doubtless, due to the fact that the roots first developed were all killed, and new ones had to be formed where the bulbs were not actually destroyed.

Hyacinths suffered badly, the white and red varieties more than the blue ones. Those in nursery beds, planted early in the previous September, were quite destroyed, whilst older bulbs planted under similar conditions six weeks or two months later survived. Hitherto winter covering for hyacinth beds had not been found to be of advantage at Kew; but in such winters as that of 1894–5 it is necessary. The wild type, *Hyacinthus orientalis,* was nearly all killed in the border.

Irids.—Many of the *Oncocyclus* group were killed, the rhizomes proving to be quite rotten when examined after the frost had gone. The "English" iris did not stand so well as the "Spanish" iris; of the former about 75 per cent. were killed. Of the English iris the survivors were so weak that they were not worth the trouble of lifting for replanting. *Iris reticulata* stood without any shelter and flowered freely; some of the bulbs dug up after they had ripened off were dried up, whilst others were perfectly sound. Many species of *Crocus* were killed outright; others were badly injured. *Crocus sativus*, for example, managed to exist on the food stored up in the corms themselves; all the roots had been killed, and in some cases the lower portion of the corms. *Gladiolus Colvillei* and its variety *alba*, planted in the open ground in January as in previous years, were killed.

Herbaceous Plants.—Lack of space renders it impossible to give a detailed statement of the losses incurred, but a few comparisons may well be mentioned. *Meconopsis wallichiana* (a fine lot of plants in pots in a cold frame) was killed under glass, whilst a couple of unprotected plants in the rockery survived and flowered. The pampas grass, *Gynerium argenteum*, was killed in the rockery, whilst on the open lawns in many places the plants, although much injured, survived and

flowered. The same remarks apply to the New Zealand *Arundo conspicua.* Even some of our native plants did not withstand the severities of the winter as well as many from countries in more southern latitudes with a warmer climate than Britain. Our native thyme, *Thymus Serpyllum*, was much cut and did not break again from the bare branches until late in the season. *Dryas octopetala* behaved in a similar way. The Cape of Good Hope *Berkheya Radula* was killed outright, whilst *B. purpurea*, under exactly similar conditions, came through the ordeal unscathed. The collection of primulas in pots in a cold frame withstood the winter successfully (better than they did that of 1893–4); there were very few deaths, and these were perhaps not due to cold. On the other hand, a considerable number of Alpine and dwarf herbaceous plants, grown in pots in cold frames for exhibition when in flower in the Alpine House, succumbed. Kniphofias, even where well sheltered with dry leaves, suffered a good deal in some spots; in others they were untouched. *Fluggea japonica*, large breadths of young plants being grown on for forming a turf in shady places where grass does not thrive, was all killed, whilst old masses which had not been transplanted were but slightly injured. Many of the cacti grown in a cold frame in the herbaceous ground were killed; amongst these may be mentioned *Opuntia brachyarthra*, *O. aurantiaca*, *O. imbricata*, *Echinocactus Wislizeni*, *Cereus cirrhiferus*, &c.

Conifers.—*Pinus insignis*, which usually suffers every winter at Kew, was scarcely affected by the frost of February. *P. tuberculata* and *P. muricata* were somewhat injured, but will soon recover. *Pinus rigida* lost most of its leaves, but has since completely renewed them. Two plants out of three, of *Podocarpus chilina*, which have stood out at Kew for the last twenty years, were quite killed; the third has grown again from the buried part of the stem. The cypresses which have quite succumbed are *C. torulosa* and *C. glauca*; *C. sempervirens* and *C. macrocarpa* have been badly injured. The Golden Retinosporas have lost many small branches, whilst the ones with green, silvery, or glaucous foliage remain untouched.

Shrubs, &c.—As a rule, even shrubs generally regarded as perfectly hardy, which had been transplanted the previous autumn, were much cut up by the frost, whilst the same species which had not been removed were much less affected. Young plants of many species were killed, whereas older ones of the same species were only badly injured. Examples are *Azalea rhombica*, *Daphniphyllum*, variegated *Elæagnus*, and *Rhamnus Alaternus variegata*. In a few cases exactly the reverse has happened; as, for instance, *Berberis Darwini* and *Baccharis halimifolia*, old plants of which were killed back to hard wood and did not break again, whereas smaller ones broke freely. Double gorse and *Ulex nanus* were both killed to the ground; even in rather sheltered spots the common gorse suffered as much at Kew as it did on the commons in the neighbourhood of London. The Irish upright gorse was quite killed. Amongst other *Leguminosæ* which may be mentioned are *Cæsalpinia japonica*, young plants of which were killed, whilst older ones were uninjured. Of the yellow Spanish broom fully 90 per cent. were quite killed; young plants of *Halimodendron argenteum* died, but older ones were unaffected. The South European *Coronilla juncea* was killed even against a wall.

Peat-loving plants afford some curious results. The common Ling, *Calluna vulgaris*, and some of its varieties suffered so much that they have had to be destroyed. The only Ericas which were killed outright are *E. mediterranea*, *E. codonodes*, and some of the varieties of *E. cinerea*.

Old plants of the Cornish Heath, *E. vagans*, and of *E. cinerea* were crippled beyond recovery. *E. stricta* was damaged, but has since quite recovered. A large quantity of *Azalea indica*, raised from seed collected by Professor C. S. Sargent in Japan, stood out in the nursery, some protected, others not at all; and not one has been killed. The old single white hairy-leaved *Azalea indica* shows now no traces of the trials through which it has passed, and *A. amœna* has shaken off the effects of the frost. Judging from the behaviour of the two last-mentioned plants at Kew the former seems the hardier. *Dabeocia polifolia;* of all the stock at Kew only two plants were quite uninjured; the old plants were killed to the ground and a few young ones killed outright; but on the whole young plants have stood better than the old ones.

New Zealand shrubs have suffered much. In fact *Plagianthus Lyalli* is perhaps the only one which has entirely escaped. *P. betulinus*, in the open, was quite killed, and *P. pulchellus*, against a wall, was killed to the ground. Most of the shrubby Veronicas were badly hurt. *Rubus australis* was killed against a wall. Large beds of *Olearia Haastii* were cut down to ground, but are now breaking freely; young stuff was completely killed. *O. Traversi* and *O. macrodonta* were killed in the open; the latter even against a wall.

Choisya ternata in the open has stood well, as also against a wall, this is perhaps the only Mexican flowering shrub which can fairly be called hardy in the neighbourhood of London. Of *Ceanothus*, *C. cuneatus* is the only one at Kew which is absolutely untouched. The following species were completely killed, even against a wall: *C. papillosus*, *C. rigidus*, *C. veitchianus*, and *C. dentatus*. The garden hybrids, such as Gloire de Versailles, &c., had their points killed in the open, but they broke freely and have flowered abundantly. Some of the younger stock were also slightly cut back although they were protected by dry leaves and spruce branches. A covering of dry leaves kept from being blown away by spruce or cedar branches is the most effective winter protection for young or tender shrubs.

The only hardy *Escallonia* is *E. philippiana*, which we never attempt to shelter at all. All the other species, in spite of protection, were badly injured; some few were killed outright, others have since freely broken from the ground level. Other South American plants which have suffered are the Azaras; the only one which has escaped in the open (where it was cut to the ground) is *A. microphylla*.

Of all the species of *Cistus* only one can be depended upon near London, viz., *C. laurifolius*, which passed through the winter unscathed, all the others being killed in the open. The shrubby Helianthemums, such as *H. alyssoides*, *H. formosum*, &c., have mostly managed to survive.

Corylopsis himalayana is alive against a wall, but has perished in the open; the other species of *Corylopsis* have not been injured in any way. One Chinese member of the witch hazel family has succumbed in the open, *Loropetalum chinensis;* this makes a pretty cool-house bush, but it is useless trying to cultivate it in the outside garden.

Of Californian shrubs all the young plants of the following have been killed in the open:—*Carpentaria californica*, *Fremontia californica*, and *Garrya elliptica*.

Of the holly family there is not much to be stated. None of the forms of *Ilex Aquifolium* seem to have suffered, but the Chinese *I. cornuta* was badly cut (it is now, however, rapidly recovering); the Himalayan *I. dipyrena* was injured in a less degree, and the South United States

I. Dahoon was quite killed. *I. crenata*, like so many Japanese plants, has again proved its hardiness.

In previous severe frosts at Kew, Laurustinus, Arbutus and the Bay, (*Laurus nobilis*) have been killed wholesale. This year they escaped, notwithstanding exposure probably to a greater degree of cold, comparatively uninjured, nor did the evergreen oaks, of which Kew possesses many exceptionally fine specimens, suffer any appreciable permanent injury.

Bamboos.—In the *Gardeners' Chronicle* (June 22, p. 762), Mr. Bean, the foreman of the Arboretum, has given an account of the behaviour of the outdoor collection of bamboos during the winter. The following extract summarizes the facts:—"On New Year's Day the Bamboo Garden at Kew looked practically in the same state as it had done in the previous August . . . . of three dozen or so kinds, ... not one has been killed outright. About half-a-dozen have scarcely been affected at all; perhaps twice as many more have suffered only a very temporary check. Of the remainder, some have been killed to the ground, whilst the others have had the old stems so severely injured that it is unlikely these particular stems will ever regain their former luxuriant leafage, although new leaves are pushing; most of them, however, are sending up strong new growths from the base, and with all, except one or two, the visible effects of the frost will have disappeared in a few months."

Our experience shows that in gardens with climatic conditions similar to those of Kew the following species may be expected to pass through even the severest winters with no more injury than a very temporary disfigurement of the foliage, and in some instances not even that. These are, consequently, the kinds which should be selected for planting in districts new to the cultivation of bamboos, and where it would be desirable to ascertain the suitability of the climate before planting extensively:—

Arundinaria nitida, Mitford (A. khasiana, *Hort*).
Phyllostachys Henonis.
„ *nigra*.
„ „ var. *Boryana*.
„ „ var. *punctata*.
„ *viridi-glaucescens*.
„ *flexuosa*.
Bambusa palmata.
„ *pygmæa*.
Arundinaria japonica.
„ *Veitchii*.

CCCCXCVI.—LEPPETT TEA.

Several articles have appeared in the *Kew Bulletin* respecting forms of tea other than those generally met with in European commerce. In the *Bulletin* for 1889, pp. 118 and 139, an account was given of P'u-êrh tea produced in the province of Yun-nan in the south-west of China. Some of the best of this is made into balls as big as a man's head for the Court of Peking. Other qualities are made into cakes well known all over the west of China. An account of compressed or tablet tea was

given in the *Kew Bulletin*, 1890, p. 109. This is manufactured at Hankow in two qualities: the inferior from common tea-dust which adheres after being steamed in a pudding-cloth and pressed by hand; the superior from the finest tea-dust which is selected with great care. The latter is manufactured into tablets by steam machinery in a steel mould. Besides these tablet teas there is a pressed tea called brick tea, used in Chinese Mongolia and Tibet. This is made of the whole leaf and the stalks, and is about the size and shape of an ordinary brick. Another and a very novel method of using tea leaves is described in the *Kew Bulletin*, 1892, p. 219. This is the Lao tea of Upper Siam, in the neighbourhood of Chiengmai. The leaves are not used for making an infusion, but are prepared wholly for the purpose of chewing. The habit of chewing "mieng," as this tea is called, is almost universal among the Laos and to men engaged in hard work, such as poling or rowing, it is said to be almost indispensable. There is yet another tea called Leppett, or Letpet tea, which is an article of local commerce in Burmah. Pony caravans carry it for sale to Mandalay and other neighbouring markets, and the Flotilla Company's steamers on the Irawady carry, sometimes, hundreds of baskets of this tea as deck cargo. In Mason's "Burmah," 1860, p. 505, there is a reference to a tea-tree from which the Burmese made a tea called "let-pet-ben." On the authority of Dr. McClelland this tree was *Elæodendron orientale*. There are references to the tea under the name of "pickled tea" in Watt's "Dictionary of the Economic Products of India," Vol. II., pp. 74–76, where it is said that it is eaten as a preserve with other articles of food; and in Vol. VI., pt. 3, p. 449, where it is stated that the European planters at Chittagong have endeavoured to prepare pickled tea for the Burma market with some degree of success. It is added: "a great future may be in store for this new industry." Samples of Leppett tea were obtained for the Kew Museums, through the Secretary of State, from the Government of India, in October 1894, and again in September 1895. There is no doubt the plant yielding it is the ordinary Assam tea-plant (*Camellia theifera*). The identification of it as *Elæodendron orientale* was from the first improbable, as the latter species is limited to Mauritius and Madagascar, and is unknown in Burma or, indeed, in any part of our Indian possessions.

The following official correspondence gives a very complete account of the Leppett tea industry:—

India Office to Royal Gardens, Kew.

India Office, Whitehall, S.W.,
30th October 1894.

Sir,

I am directed by the Secretary of State for India to forward herewith a copy of a letter from the Government of India, together with a note by Mr. W. A. Graham on "Leppett" tea the product of the plant *Elæodendron orientale*.*

The specimens of "Leppett" tea referred to in the above letter have been forwarded to your address by carrier.

I am, &c.
(Signed) C. E. Bernard,
Secretary.
Revenue and Statistics Department.

The Director,
Royal Gardens, Kew.

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* See correction in Kew letter dated 25th November 1894: the plant is *Camellia theifera*.

"Leppett" Tea.

No. 49, 5 A., 10, dated Rangoon, the 4th July 1894, from C. G. Bayne, Esq., I.C.S., Revenue Secretary to the Chief Commissioner of Burma, to the Secretary to the Government of India, Department of Revenue and Agriculture.

In continuation of this office letter No. 120, 5 A. 10, dated the 7th May 1894, I am directed to submit, for transmission to Her Majesty's Secretary of State for India, seven packets containing samples of the "Leppett" tea of Burma. Four packets contain "wet Leppett" and three packets "dry Leppett." Two specimens of the plant are also submitted. A copy of a note by Mr. W. A. Graham containing information regarding the tea is enclosed.

Information regarding the "Leppett" Tea of Burma, by Mr. W. A. Graham.

1. By far the greater quantity of the tea consumed by the Burmese, called "Leppett," is grown in the Yaung Baing State of the Northern Shan States. This State is entirely given up to the cultivation of the tea tree, and the inhabitants one and all, including the Sawbwa himself, trade in the commodity.

2. The gardens are situated on the hill-sides, which, in this neighbourhood, are very steep. The trees continue to yield crops of leaves suitable for the market until they reach maturity and a height of some 60 feet, but the best article is obtained from the young shrubs, of which the gardens chiefly consist. Two crops of tea are secured each year, one in May and one in July, only the young and tender leaves being taken. The leaves, while still green, are boiled in large narrow-necked pots made for the purpose. When thoroughly boiled the contents of the pots are turned into large pits dug in the ground. These pits are square and about 6 feet deep; the sides and bottom are lined with thin walls of plantain leaves, which keep the tea pure from contact with the earth. The pit being full of boiled tea and the juices from the pots, a top made of plantain leaves is placed over it and earth is piled above it, big stones and other heavy weights being finally placed on the top.

3. The tea is thus preserved and compressed for some months, when the trading season coming on, the pits are opened and the tea is sold to the traders, who come with their caravans of bullocks and carry it away to the Mandalay market. For transport the tea is packed in long baskets, of which each bullock carries two. The baskets have no lid, but are covered in with strips of bamboo, so arranged as to serve the purpose of a lid in being air-tight, and at the same time to admit the insertion of a wedge, the pressure of which prevents fermentation from setting in. Every day the wedges are hammered in a little further, so that although the tea dries in the baskets and shrinks, a constant pressure is kept up.

4. The price of the tea at the gardens ranges from Rs. 15 to Rs. 25 per 100 viss.* When sold to the brokers in Mandalay it fetches from Rs. 60 to Rs. 100, or even to Rs. 140 per 100 viss. As the tea loses weight a good deal in transit from Yaung Baing, the traders on nearing the market usually throw the baskets for a day or two into the nearest stream, by which simple process the article is made to recover its lost dampness, and weighs as much as it did when purchased. In Upper Burma and the Shan States a good deal of this tea is consumed as a

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* Viss or piakthah = 3·6 lbs. av.

drink, for which purpose it is sold in a dry state. It is prepared by boiling it in an earthen kettle, and is drunk with salt. The greater bulk, however, is sold by the Mandalay brokers to merchants in Lower Burma, where it is largely consumed in the solid. The leaves are soaked in oil, a little garlic, dried fish, &c. added, and the concoction thus formed eaten, being considered a great dainty. Besides being regarded as a dainty, however, the "Leppett" is a traditional food among Burmans. At the important junctures of a man's life, such as birth, initiation into the church, marriage, and death, "Leppett" plays an important part, and no ceremony is complete without the consumption of that article. The tea remains in the same basket from the time it is bought at the gardens until it is sold by the merchant to the actual consumer. Large numbers of baskets are to be seen at every wharf along the Irawady banks and in the bazaars throughout the country.

ROYAL GARDENS, KEW, TO INDIA OFFICE.

Royal Gardens, Kew.
November 26th, 1894.

SIR,

I HAVE the honour to acknowledge the receipt of your letter of October 30, with enclosures, relating to Leppett tea. The specimens referred to were subsequently received.

2. The information given by Mr. W. A. Graham is extremly interesting.

3. The identification of the plant producing the product with *Elæodendron orientale* appears to have been due to Dr. McClelland. It is on the face of it improbable as this species is limited to Mauritius and Madagascar and is unknown in Burma or indeed any part of our British possessions.

4. There can be little doubt from a close examination of the specimens that Leppett tea is the produce of *Camellia theifera*, the wild tea of Assam, where it was discovered in 1834. And I learn from Sir Dietrich Brandis that as a matter of fact the plant is abundant in Upper Burma and on the Upper Shan hills. The identification is historically interesting as rendering it probable that the Burmese were acquainted with the value of the indigenous plant before its discovery in Assam by Europeans. It further indicates the existence of a new area suitable for the tea industry.

I am, &c.
(Signed) W. T. THISELTON-DYER.

Sir Arthur Godley, K.C.B.,
India Office, Whitehall, S.W.

INDIA OFFICE TO ROYAL GARDENS, KEW.

India Office, Whitehall, S.W.
20th September 1895.

SIR,

IN continuation of previous correspondence, I am directed by the Secretary of State for India to forward herewith a copy of a letter received from the Government of India regarding Leppett tea (*Camellia theifera*), together with four specimens of the plant, and also a copy of a valuable report by Mr. C. W. A. Bruce on the tea industry of the

Upper Chindwin. It is suggested that extracts from Mr. Bruce's paper may be found of sufficient interest for reproduction in the *Kew Bulletin.*

I am, &c.
(Signed) HORACE WALPOLE.

The Director,
Royal Gardens, Kew.

REPORT on the TEA INDUSTRY of the Upper Chindwin, by C. W. A. BRUCE, Esq., Assistant Conservator of Forests, Upper Chindwin Division.

The following is a list of the villages of the Upper Chindwin which export tea-seeds, the inhabitants of all being Shans :—Kaungkan, Tingin, Kawya, Maungkan, Tasôn, Onbet, Mainwe, Tamanthe, Malin.

Tradition says that these "kins" (clearings) were cleared and planted some 200 years ago, the seed having been brought from Palaung (Northern Shan States). No one has ever heard of wild tea in the jungle; the gardens were originally planted for the sake of the leaves, that is, to make "letpet" the so-called pickled tea of Burma. However, some 20 years ago there arose a demand for the seed, at first intermittent, but since British occupation steady, and this has now become the main source of income to the owners, though the pickled tea is still collected and made as of old.

Method of Planting, &c.—The first thing to be done in planting a "letpet-kin" is to find the right kind of soil, what is known as "myeni," literally red earth. In this soil the tea-tree flourishes to perfection; the look of this earth is very characteristic, being a light red or buff-coloured friable loam, which occurs in patches, and wherever these patches of red earth are found on the banks of the Chindwin there villages have been built and tea planted. The jungle being cleared of all brushwood and undergrowth, three or four seeds are dibbled into holes, the holes being either two or four cubits apart. The object of dibbling in more than one seed is to guard against blanks; however, all the seeds that germinate are allowed to grow. After the plants come up all the tending the gardens receive is periodical clearing of grass, small plants, weeds, and brushwood; the ground is never hoed nor the plants pruned, except when the ravages of a parasite known as "chibaung" have become so extensive as to kill the portions above ground; the dead tops are then hacked down with the ordinary Burmese dama, the plant at once throwing up stool shoots or root-suckers which in three years take the place of the old cut down plant. The small plants become large enough to give a crop of leaves in three years if the kin is kept free of jungle, but not till five years if the garden is "dirty." Seed is borne when the plants are eight years old, but they do not come into full bearing till 15 years of age, the normal existence of a tree being 40 to 50 years, if not attacked by the parasite mentioned above. Some trees last longer than this, but old trees do not bear such good crops of seeds or leaves as middle-aged ones, being usually stagheaded, and are generally cut down, their places being taken by vigorous shoots thrown up by the stools, some stools as large as 3 feet in girth being seen. A light shade is beneficial to the plants and lessens the labour of keeping the gardens clean, as the shade kills out the rank grasses, such as thekkè, &c., which spring up if there is no shade. Heavy rains are not good for the seed-crop, as the seed drops off

without ripening; however, if the seed-crop is poor, the leaf-crop is usually good, and *vice versâ.*

Ownership.—Each house owns from one to three *kins*, the various properties being bounded by rough cactus hedges.

Crops.—As already stated, there are two kinds of crops—the leaf-crop and the seed-crop.

(*a.*) *The Leaf-crop.*—The trees flush three times a year in—(1) Tagu to Kasôn (April–May); (2) Wazo to Wagaung (July–August); and (3) Tawthalin to Thadingyut (September–October). Of these three flushes the first gives the best leaf, and brings the highest prices. The method of plucking is to pluck the whole shoot except one leaf, which is left. Thus, if there are three leaves in a shoot, the shoot is nipped off just below the second leaf. Each owner then takes his crop of leaves and throws it into an iron cauldron* full of boiling water; it is left in this water till the leaves turn a yellow colour; the water is then thrown away and the leaves rolled by hand on mats; it is then ready to be sold to traders, who take it away either packed in bamboo crates or in the internode of the *myetsangye* bamboos (*Dendrocalamus Hamiltonii*). If one wanted to keep this tea, it must either be kept buried in the ground or the crates and bamboos must be kept in water. Kawya village, which has the largest extent of "kins," makes on the average 20,000 viss of *letpet* annually. The price at the village for the produce of the first flush is usually Rs. 16 per 100 viss, for the other and later flushes Rs. 12–8 per 100 viss.

(*b.*) *Seed-crop.*—The seed-crop ripens in October and November; it is then collected, dried in the sun and sold to Burmese traders, who come up for it. The trader shoots the seed into the bottom of his boat, the bottom being roughly lined with mats, and then takes it down to Kettha or Tônhè; where he sells it to the native agents of "tea-seed chiefs."

Value.—The price of the tea-seed on the garden varies from Rs. 3 to Rs. 10 per basket, but to understand the method of buying one must bear in mind that the trader, always a Burman, comes up in January or February to bargain for the seed-crop of the following November. If possible, the trader makes a contract that the owner will sell him all the produce of the garden for a fixed sum per basket. Thus, in January 1894, the Maungkan villagers contracted to sell all their seed at Rs. 5 a basket. The trader then advances on the condition that, if the villagers cannot pay him back in tea-seed, they must pay him Rs. 100 per cent. on his money. If the trader cannot get a contract for the whole crop, he always manages to make advances for a certain proportion of the crop on the same condition. Thus, this year all the villagers of Kawya have had advances on the condition that they pay back next November (in seed), each basket to be counted as Rs. 3. Any left after the villagers have paid back, their advances usually brings double the contract price. The trader then hires boats and takes the seed to Kettha or Tônhè, the rate of boat-hire being from 2 annas to 4 annas per basket, according to distance at Kettha. He will sell to agents of the tea-planter for an average of Rs. 17 per maung (a maung = 1 basket 10 pyis, or 26 pyis). This is practically the end of the business as far as Burma is concerned, as from here it is carried by Chin or Manipuri coolies in baskets, Scotch fish-wife fashion to Manipur. No tax is collected or any transit dues exacted anywhere along the route. The Chins are said to carry a load of one basket and a quarter, the average

* The ordinary dè of Burma, similar to the one cutch is cooked in.

weight of one basket being 14 viss, and get Rs. 5 to Rs. 6 for the journey.

Conclusion.—It will be seen that, as in most trades, the middlemen are the best off and absorb most of the profit. The Burman trader makes, even if he does not go in for the advance system, over cent. per cent., and of course his profits are doubled if he does. The Thaungdut Sawbwa has, I am told, petitioned the Government to be allowed to levy transit dues on the tea-seed passing through his State, though on what he bases his claim to the right I fail to see. No Thaungdut coolies or men in any way are interested in the trade, the development of which is solely due to the Bengalis and Burmans. The Sawbwa's clerk, Maung Kyauk Lôn, alleges that the Sawbwa used to collect six annas per basket in Burmese times; this statement is false, according to every other person I have questioned. The only transit tax the Sawbwa has ever levied was one on boats and rafts passing Thaungdut town; this has, of course, now been long discontinued. He had never anything whatever to do with the tea-seed trade. I believe Messrs. the Bombay-Burma Trading Company are experimenting as to the feasibility of sending seed to Assam viâ Calcutta; of course, if they succeed that will settle all matters of transit dues both for Thaungdut and Manipur. I see no reason why the Bombay-Burma should not succeed, as no care to prevent shaking, the effects of damp or of heat, is taken, any way prior to the seed reaching Manipur, by the present method, which seems to be as unscientific as possible, and yet the tea-seed has, as is well known, a first-class reputation in Assam for germinating properties. The tea-seed experimented with, however, I would recommend being bought at any cost in November; the best way, of course, would be to advance money on the following season's crop, this system being the custom, or else only the leavings and old seed which has been lying about can be got, which naturally would not have the same germinating power as fresh ripe seed.

From what I saw of the gardens they were wonderfully healthy considering the little care taken with them, as with the exception of the parasite referred to, the trees all seemed clean, vigorous, and full of leaf. I should say tea-planting with European methods would be a great success if only the labour question could be successfully dealt with; that once settled, all a planter who proposed planting in the Chindwin would have to do would be to prospect for red earth, and from my own experience of the forests I am sure I have come across several tracts of similar earth to that on which the tea is grown. I enclose a specimen of the tea parasite.*

CCCCXCVII.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECAS XXIII.—XXV.

221. **Uvaria virens,** *N. E. Brown* [Anonaceæ]; ramulis pilis minutis fasciculatis ferrugineo-pubescentibus, foliis petiolatis oblongis obtuse acuminatis basi plus minusve rotundatis undulatis junioribus subtus

* Not received.

parce stellato-pubescentibus demum glabris, floribus subsessilibus binis, sepalis late ovatis obtusis parce stellato-pubescentibus, petalis ellipticis vel elliptico-oblongis obtusis revolutis glabris viridibus demum luteo-viridibus, antheris apice truncatis brunneis, stigmatibus truncatis primum ochraceis vel luteo-ochraceis demum fuscis.

Habitat.—Delagoa Bay, *Mrs. Monteiro.*

Foliorum petioli 2–3 lin. longi, laminæ 2¼–5¾ poll. longæ, 10 lin.–2 poll. latæ. *Sepala* 2½–3 lin. longa, 2½ lin. lata. *Petala* 5 lin. longa, 3½–4 lin lata.

Described from a living plant raised at Kew, from seeds sent by Mrs. Monteiro, in 1886.

222. **Begonia Somervillei,** *Hemsl.* [Begoniaceæ]; caulescens, gracilis, undique glabra, ramis flexuosis, internodiis petiolos graciles paulo excedentibus, foliis, ut videtur, membranaceis vel saltem in siccis tenuissimis oblique oblongis caudato-acuminatis basi semicordatis margine remote obscureque denticulatis, inflorescentia masculina laxe cymosa axillari et pseudoterminali foliis breviore, ramulis pedicellisque gracillimis, floribus masculinis minimis, sepalis duobus orbicularibus cucullatis, petalis nullis, staminibus numerosis omnino liberis, antheris clavatis, connectivo non producto.

Habitat.—Solomon Islands, chiefly New Georgia. *Officers of H.M.S. "Penguin,"* 1894–5.

Internodia superiora 1–1½ poll. longa. *Folia* cum petiolo 5–9 poll. longa. *Cymæ* 1½–3 poll. diametro. *Pedunculi* 2–3 poll. longi. *Pedicelli* 2–3 lin. longi. *Sepala* 1½–2 lin. diametro, stamina inclusa.

Commemorative of Boyle T. Somerville, Lieutenant, R.N., one of the collectors.

223. **Begonia Weigallii,** *Hemsl.* [Begoniaceæ]; caulescens undique glabra, ramis crassiusculis subcarnosis, internodiis quam petioli longioribus, foliis, ut videtur, membranaceis vel saltem in siccis tenuissimis oblique ovatis longe caudato-acuminatis basi semicordatis lobo petiolum æquante margine obscure denticulatis, venis primariis paucis crassiusculis, inflorescentia masculina dense cymosa, cymis subterminalibus ramulis crassiusculis, pedicellis brevissimis crassiusculis, florum masculinorum sepalis 2 orbicularibus, petalis nullis, staminibus numerosis, filamentis ima basi tantum cohærentibus, floribus femineis geminatis (an semper?) pedunculis pedicellisque brevibus crassis probabiliter carnosis, sepalis 2 late ovato-oblongis, petalis 2 oblongis, stylis 3, stigmatibus sinuoso-ramosis, fructu fere æqualiter trialato lateraliter dehiscente una facie angusta, alis membranaceis apice truncatis basi rotundatis.

Habitat.—Solomon Islands, chiefly New Georgia. *Officers of H.M.S. "Penguin,"* 1894–5.

Internodia superiora ½–2 poll. longa. *Folia* cum petiolo 3–7 poll. longa. *Inflorescentia* masculina cum pedunculo 4 poll. longa et 3 poll. lata. *Sepala* 3–4 lin. diametro. *Florum femineorum* geminatorum pedunculus 3–8 lin. longus; pedicelli circiter pollicares. *Sepala* et *petala* circiter semipollicaria. *Fructus* latior quam longus, 12–15 lin. diametro.

Commemorative of S. Weigall, Lieutenant, R.N., one of the collectors.

The fruit described above was with the flowering specimens of *B. Somervillei*, but after examining the female flowers of *B. Weigallii*, I have no doubt it belongs here.

224. **Cremaspora coffeoides**, *Hemsl.* [Rubiaceæ]; ramis floriferis elongatis gracillimis strigillosis cinereis internodiis brevibus, foliis distichis breviter petiolatis subcoriaceis anguste oblongis vel oblanceolatis acuminatis vix acutis basi rotundatis vel subcuneatis præter costam venasque primarias strigillosas cito glabrescentibus pallide viridibus, venis primariis lateralibus utrinque sæpissime 4 longe arcuatis, pedunculis brevissimis axillaribus circiter 6–floris, floribus minutis subsessilibus sericeis basi bibracteolatis, calycis lobis anguste deltoideis acutis erectis persistentibus, corollæ crassæ extus sericeæ tubo, ut videtur, brevissimo sed bene evoluto non viso, lobis ovato-oblongis obtusiusculis, bacca ovoidea primum strigillosa demum nuda.

Habitat.—British Central Africa: north side of the Ruo, *Sir H. H. Johnston*, 1895.

Folia 3–5 poll. longa, 1–1½ poll. lata, petiolis 2–3 lin. longis. *Alabastra* vix sesquilin. longa. *Baccæ* 3–4 lin. longæ.

225. **Geophila picta**, *Rolfe* [Rubiaceæ]; herbacea, caulibus subprostratis pubescentibus, foliis breviter petiolatis ovato-oblongis obtusis basi cordatis strigoso-pubescentibus venis primariis arcuatis, capitulis pedunculatis multifloris, bracteis lanceolatis acuminatis ciliatis, ovario glabro calycis lobis 5 subulato-lanceolatis æqualibus glabris, corollæ tubo subelongato fauce ampliato intus villoso, lobis patentibus lanceolato-oblongis subacutis, staminibus 5 tubo corollæ insertis, filamentis brevibus, antheris linearibus, stylo subexserto apice bidentato, stigmatibus divergentibus.

Habitat.—British Guiana: Demerara, *Im Thurn.*

Planta circa 3–4 poll. alta. *Folia* 1–2½ poll. longa, ¾–1¾ poll. lata; petioli 1½ lin. longi. *Pedunculi* ¾ poll. longi. *Capitula* ¾ poll. lata. *Bracteæ* 4 lin. longæ. *Ovarium* ½ lin. longum. *Calycis lobi* ¾ lin. longi. *Corollæ tubus* 4 lin. longus, lobi ½ lin. longi.

An interesting species which flowered in the establishment of Messrs. F. Sander & Co. in September last. The leaves are dull green on the upper surface, with a pink mid-rib and numerous pink appressed hairs all over, puberulous, and suffused with dull glaucous purple beneath. The corolla is white. It is readily distinguished by the relatively short petioles.

226. **Osmanthus Cooperi**, *Hemsl.* [Oleaceæ]; species *O. Aquifolio forma foliis integris* simillima differt imprimis foliis majoribus tenuioribus venis immersis fere obsoletis; undique glabra, ramulis floriferis gracilibus albidis crebre lenticellatis, foliis longe petiolatis coriaceis lanceolato-oblongis vel oblanceolatis subito cuspidulato-acuminatis basi cuneatis sæpius leviter inæqualibus semper integerrimis margine incrassatis costa supra impressa subtus elevata, floribus masculinis fasciculatis graciliter pedicellatis, fasciculis 3–6-floris axillaribus sæpe geminatis basi bibracteatis, bracteis brevibus latis mucronatis, calycis minuti lobis rotundatis erosis, corollæ subcarnosæ lobis oblongo-spathulatis apice rotundatis, antheris subsessilibus, ovario rudimentari parvo oifido.

Habitat.—China : probably a native of the hills near Ningpo. Specimens from a tree cultivated in the garden of H. B. M. Consulate at Ningpo, *Playfair.*

Arbor 12-pedalis, fide Playfair. *Folia* cum petiolo usque ad 5 poll. longa sed sæpius breviora; petioli 6–12 lin. longi. *Pedicelli* 3–6 lin. longi, bracteis maximis vix lin. latis. *Calyx* $\frac{1}{2}$–$\frac{1}{3}$ lin. diametro. *Corolla* 3–4 lin. diametro.

Respecting this tree, Mr. G. M. H. Playfair, H.M. Consul at Ningpo, writes :—"Mr. W. M. Cooper, formerly Consul here, informed me a short time since that he believed a certain *Olea* in the garden of the Consulate to be of an undescribed species. The tree was, I presume, transplanted by him from the neighbouring hills, like many others in the compound.

227. **Nepeta suavis,** *Stapf* [Labiatae]; perennis basi indurata canescens, caulibus tomentellis, foliis petiolatis e basi cordata ovatis obtusis obtuse crenatis utrinque tomentellis supra rugosis, verticillis in spicas inferne interruptas angustas dispositis, bracteis infimis plus minusve foliaceis cæteris albo-membranaceis viridi-venosis ovatis vel ellipticis vel oblongis villosulis calyces æquantibus, calyce villosulo leviter curvato ore oblique truncato edentulo vel dentibus obscuris obtusissimis latisque interdum uno alterove abrupte in mucronem brevem abeunte, corollæ pallide roseæ tubo curvato quam calyx subduplo longiore pubescente labio supero brevi bilobo lobo labii inferioris intermedio pupureo-punctato medio hirsuto emarginato crenulato, nuculis verruculosis.

Habitat.—Afghanistan : *Griffith*, 4060 Kew Distr.; Kuram Valley, Kaiwas and Shalizan, *Aitchison* 643.

Herba 1–2 ped. alta. *Folia* majora 7–12 lin. longa, 5–8 lin. lata; petioli ad 4 lin. longi. *Inflorescentia* ad 6 poll. longa. *Calyx* 3 lin. longus. *Corolla* 5 lin. longa.

A plant raised in the Royal Gardens from seeds communicated by Mr. J. F. Duthie in 1878, agrees with Griffith's dried specimens and Aitchison's quoted above ; but it is taller and much less hairy, and has leaves at least twice as large. The two lower calyx-teeth are nearly always produced into short mucros, whilst the middle tooth of the upper lip is generally very small and triangular, or sometimes quite suppressed. *Nepeta suavis* is nearly allied to *N. leucophylla*, Benth., from which it differs mainly in the calyx and in the broader bracts.

228. **Salvia schiedeana,** *Stapf* [Labiatæ]; caule tomentello-pubescente, foliis longiuscule petiolatis e basi rotundata vel breviter cuneata ovatis acutis crenatis utrinque minute parceque puberulis, verticillis densis in spicam subinterruptam dispositis, bracteis viridibus quam verticilli subbrevioribus vel summis multo brevioribus ovatis acuminatis ciliatis, floribus breviter pedicellatis, calyce tubuloso demum inferne subinflato superne a latere compresso clauso 3-dentato dentibus late ovatis breviter acuminatis 9-nervi in nervis prominentibus dense breviterque pilosis, corolla cyanea e calyce vix exserta tubo medio constricto et intus denticulis 2 instructo superne dilatato labio supero extus piloso erecto bilobo marginibus recurvis, labio infero trilobo porrecto lobis latis intermedio emarginato, stylo parce pilosulo labio infero breviore.

Habitat.—Mexico, *Deppe & Schiede.*

Planta 1·5 ped. alta. *Folia* majora ad 3 poll. longa, 2 poll. lata, petiolis ad 1·5 poll. longis. *Inflorescentia* ad 5 poll. longa. *Calyx* 4 lin. longus.

Specimens of this plant were raised in the Royal Gardens from seeds received from Vallombrosa under the name of *Hedeoma nepalensis*, and the description is actually drawn up from them. No indication was given as to the native country of the plant; but I have identified it with a coloured drawing in the collection of a plant "raised in 1829 from South American seeds collected by Messrs. Deppe and Schiede." *Salvia schiedeana* is nearest allied to *S. tiliæfolia*, Vahl.

229. **Polygonum (Bistorta) constans,** *Cummins* [Polygonaceæ]; gracilis, glabra, foliis cordatis ovato-lanceolatis caudato-acuminatis marginibus sinuosis inferioribus petiolatis superioribus sessilibus amplexicaulibus quam inferiores angustoribus, floribus in 1–3 racemos dispositis, racemorum pedunculis brevibus, ovario ovato, stylis 3 gracilibus basi connatis, stigmatibus capitatis.

Habitat.—Sikkim, *C. B. Clarke*, and Beroom at 12,000 ft. Thibet, *Dr. King's collector.*

Herba 6–12 poll. alta. *Stipulæ* ¾–1 poll. longæ. *Folia* 2–2½ poll. longa, ¼–¾ poll. lata; petioli ¾–1 poll. longi. *Racemi* ¾–1½ poll. longi. *Perianthii* segmenta ⅙ poll. longa. *Fructus* ignotus.

Near *P. amplexicaule*, Don., from which it differs in its thinner stem, narrower and more delicate leaves each with usually a contracted basal sinus and pointed basal lobes, also in its more slender and very shortly peduncled racemes.

230. **Arundinaria nitida,** *Mitford*, in Gard. Chron., xviii., 1895, p. 186, fig. 33 (nomen solum); ramis gracilibus paucifoliatis pallidis vel fuscescentibus, laminis patulis lineari-lanceolatis basi breviter subitoque in petiolum brevem attenuatis glabris subtus glaucis in margine asperis nervis secundariis utrinque 2–3 venulis transversis tenuibus approximatis, vaginis arctis striatis glabris in ore setis paucis instructis, ligula brevissima ciliolata, panicula parva ramis inferioribus ramulosis cæteris simplicibus omnibus glabris lævibusque in axillis glandulas foventibus, spiculis 2–4-floris glabris, gluma i. quam ii. multo breviore utraque 7-nervi inter nervos tenui, glumis florentibus lanceolatis quam gluma ii. multo longioribus dissitis apicem versus scaberulis 7-nervibus, palea bicarinata inter carinas sæpe et extra eas semper 2–1-nervi in carinis apicem versus aspera, lodiculis 3 ovatis apice fimbriatis.—*A. khasiana*, W. J. Bean in Gard. Chron., xv., 1894, p. 301, non Munro.

Habitat.—China: Hupeh, Fang District, on cliffs, 6000–9500 ft. *A. Henry*, 6832; North Szechuen, *Potanin.*

Frutex ramosissimus teste *A. Henry* in loco natali 1–2 ped. altus; cultus vero multo altior. *Folia* 2–3 poll. longa, 3–5 lin. lata. *Panicula* 1½–3 poll. longa; ramuli infimi ad 2 poll. longi; pedicelli longitudine valde varii ad 6 lin. longi. *Spiculæ* ad 9 lin. longæ; rhachillæ articuli intermedii ad 3 lin. longi. *Glumæ* florentes 5 lin. longæ,

Nearest allied to *Arundinaria sinica*, Hance (*A. longiramea*, Munro), a native of Hong Kong, but differing in the abundant ramification, the slender, few-leaved branches, the much smaller and somewhat differently shaped leaves and the small panicle. The description was drawn up from the wild specimens quoted above.

Seeds of the plant were collected by N. Potanin in North Szechuen, China, and sent to the Botanic Garden at St. Petersburg, whence it was distributed.—*O. Stapf.*

231. **Clematis rubifolia,** *Wright* [Ranunculaceæ]; fruticosa, caule sarmentoso tenui tomentoso, foliis trifoliolatis pilis appressis vestitis, foliolis ovatis acuminatis dentatis triplicinerviis, cymis axillaribus 5–8-floris brevissime pedunculatis, sepalis oblongis acutis extus dense tomentosis, staminorum filamentis sepalis æquilongis pilis elongatis antheras tegentibus vestitis, stylo pilis rigidis albis hirsuto.

Habitat.—China: Yunnan, Mongtse, rocky places at 6000 ft., *W. Hancock*, 18.

Foliolum terminale 2½ poll. longum, 2 poll. latum; lateralia 2 poll. longa, 1½ poll. lata. *Sepala* et *stamina* 6 lin. longa.

This differs from *C. grata*, Wall. in the leaves not being lobed and the inflorescence almost sessile. *C. wightiana*, Wall. differs in having its leaves much more densely tomentose beneath.

232. **Xanthophyllum macrophyllum,** *Baker* [Polygalaceæ]; arboreum, ramulis glabris, foliis breviter petiolatis amplis oblongis cuspidatis subcoriaceis integris basi cuneatis utrinque viridibus glabris, floribus in paniculas laxas axillares quam folia breviores dispositis, pedicellis brevibus pubescentibus solitariis vel geminis, bracteis ovatis pubescentibus persistentibus, sepalis coriaceis obtusis pubescentibus exterioribus brevioribus ovatis interioribus longioribus oblongis, petalis angustis calyce duplo longioribus, carina panduriformi dorso pubescente, staminibus petalis distincte brevioribus, ovario cylindrico pubescente, stylo elongato incurvato glabro.

Habitat.—East coast of British North Borneo, *Governor Creagh.*

Folia subpedalia, media 4 poll. lata. *Sepala* exteriora 2 lin. longa; interiora 3 lin. longa. *Fructus* ignotus.

233. **Impatiens Hancockii,** *Wright* [Geraniaceæ]; herbacea, succulenta, caule erecto, foliis lanceolatis glabris bidentatis breviter pedunculatis subtus dilute viridibus, racemis ad axillas foliorum superiorum pedunculis elongatis paucifloris, pedicellis tenuibus, bracteis parvis ovatis caducis, sepalo postico magno saccato calcare elongato curvato tenui, lateralibus parvis, petalo antico cordato, lateralibus inæqualiter bilobis violaceis, capsula elongata angusta.

Habitat.—China: Yunnan, Mongtse plain 4600 ft., by a stream, *W. Hancock*, 62.

Caulis 1–1¼ ped. altus. *Folia* 3 poll. longa, 1 poll. lata; petiolus 3 lin. longus. *Pedunculus* 4 poll. longus; pedicelli 9 lin. longi. *Corolla* 6 lin. diam., 1 poll. longa; calcar 1 poll. longum.

An elegant species resembling *I. Textori*, Miq., but having a larger posticous sepal more suddenly contracted into a spur.

234. **Bauhinia (Phanera) Creaghi,** *Baker* [Leguminosæ-Cæsalpinieæ]; sarmentosa, ramulis glabris, foliis breviter petiolatis oblongis integris cuspidatis basi rotundatis subcoriaceis utrinque viridibus glabris e basi ad apicem triplinerviis, floribus in corymbos densos multifloros simplices dispositis, bracteis minutis caducis, pedicellis elongatis ascendentibus, calycis tubo cylindrico limbo 3–4-plo longiore lobis ovatis dorso pubescentibus cohærentibus vel demum liberis, petalis splendide coccineis unguiculatis dorso pilosis.

Habitat.—East coast of British North Borneo, *Governor Creagh.* Gathered also by *Burbidge* in 1877–8.

Folia 3–5 poll. longa, medio 1½–2½ poll. lata. *Pedicelli* inferiores 1½–2 poll. longi. *Calycis* tubus 6 lin. longus. *Petala* 9–12 lin. longa. *Fructus* ignotus.

A very showy species, nearly allied to *Phanera kocheana*, Korthals.

235. **Bauhinia (Phanera) brachyscypha,** *Baker* [Leguminosæ-Cæsalpinieæ]; sarmentosa, copiose cirrhifera, ramulis gracilibus pubescentibus angulatis, foliis distincte petiolatis late cordato-ovatis profunde bifidis 13–nerviis subcoriaceis utrinque viridibus glabris, floribus in corymbos multifloros terminales dispositis, pedicellis inferioribus elongatis sæpissime ascendentibus, bracteis minutis caducis, calycis tubo brevi cylindrico, lobis oblongis tubo longioribus, petalis obovatis unguiculatis sepalis 2–3-plo longioribus dorso pilosis, ovario cylindrico pubescente.

Habitat.—British North Borneo: near Tinkayo, *Governor Creagh.*

Folia 4–6 poll. longa et lata. *Pedicelli* inferiores 1½ poll. longi. *Calycis* lobi 3 lin. longi. *Petala* 7–8 lin. longa. *Fructus* ignotus.

Near *B. glabrifolia*, Baker.

236. **Bauhinia (Phanera) stenostachya,** *Baker* [Leguminosæ-Cæsalpinieæ]; sarmentosa, ramulis dense persistenter brunneo-velutinis, foliis longe petiolatis cordato-ovatis e basi 13–15-nerviis profunde bifidis subcoriaceis facie glabris dorso præsertim ad nervos persistenter brunneo-velutinis lobis apicalibus obtusis, floribus in racemos angustos elongatos dispositis, pedicellis brevibus ascendentibus atque rachi dense brunneo-velutinis, calycis tubo oblongo-cylindrico dense velutino lobis oblongo-lanceolatis tubo longioribus, petalis oblanceolato-oblongis sepalis paulo longioribus, ovario cylindrico stipitato dense persistenteque velutino, stylo brevi valido, stigmate magno peltato.

Habitat.—East coast of British North Borneo, *Governor Creagh.*

Folia 4–6 poll. longa et lata, petioli 2–3 poll. longi. *Calycis* tubus 5–6 lin. longus. *Sepala* 7–8 lin. longa. *Fructus* ignotus.

Near *B, Vahlii,* W. & A.

237. **Bauhinia (Phanera) macropoda,** *Baker* [Leguminosæ-Cæsalpinieæ]; sarmentosa, ramulis gracilibus glabris, foliis longe petiolatis late cordato-ovatis e basi 11-nerviis profunde bifidis subcoriaceis utrinque viridibus glabris lobis apicalibus acutis, floribus in corymbos terminales paucifloros longe pedunculatos dispositis, pedicellis brevibus ascendentibus, bracteis minutis caducis, calycis tubo cylindrico sulcato lobis oblongis tubo æquilongis, petalis obovatis unguiculatis sepalis 2–3-plo longioribus dorso pilosis, ovario cylindrico piloso.

Habitat.—British North Borneo: Port Myburgh, *Governor Creagh.*

Folia majora 5–6 poll longa et lata; petioli 2–3½ poll. longi. *Calycis* tubus 3 lin. longus. *Petala* 9 lin. longa. *Fructus* ignotus.

Near *B. glabrifolia*, Baker.

238. **Cæsalpinia bicolor,** *Wright* [Leguminosæ-Cæsalpinieæ]; arbor parva, ramis leviter striatis spinis paucis munitis, foliis bipinnatis, foliolis 8–12 alternis ovatis emarginatis glandulis pellucidis numerosissimis gerentibus, racemis terminalibus vel ad axillas foliorum superiorum

positis, calycis 5-partiti tubo brevi cupulari persistente lobo antico cucullato lobis omnibus deciduis, petalis (postico obcordato flavo excepto) obcuneatis rubro-purpureis calyce duplo longioribus, filamentis hirsutis petalis sesquilongioribus, antheris parvis dorsifixis, ovulis 5–7, stylo staminibus æquilongo, legumine rhomboideo lato compresso, seminibus circa 5.

Habitat.—Peru: Chachapoyas, *Lobb*; Vitor, *Maclean*; Colombia: Patia Valley, 1000–1500 ft. and Magdalena Valley near Garzon, *R. B. White*, No. 11.

Arbor 15–20 ped. alta. *Foliola* 6–9 lin. longa, 4-6 lin. lata. *Pedicelli* 5–9 lin. longi. *Petala* 6 lin. longa. *Filamenta* 9 lin. longa. *Legumen* 2 in. longum, 10 lin. latum.

239. **Homalium (Blackwellia) myrianthum**, *Baker* [Samydaceæ]; ramulis glabris, foliis subcoriaceis brevissime petiolatis oblongis obtusis integris basi cuneatis utrinque viridibus glabris, floribus in paniculas terminales et axillares ramulis multis elongatis gracillimis pubescentibus dispositis, pedicellis brevibus patulis apice articulatis, bracteis lineari-subulatis, calycis tubo pubescente segmentis linearibus tubo æquilongis, petalis linearibus segmentis calycinis æquilongis, stylis 3 subulatis ovario æquilongis.

Habitat.—British North Borneo: Lilam, *Governor Creagh.*

Folia 4–5 poll. longa, 2 poll. lata. *Calycis* tubus 1 lin. longus; segmenta 1 lin. longa.

Belongs to the section *Paniculatæ* of Bentham's Monograph, and is near the Mauritian *H. paniculatum.*

240. **Arthrophyllum borneense**, *Baker* [Araliaceæ]; arboreum, glabrum, foliis inferioribus pinnatis foliolis 5 magnis oblongis integris obtusis basi inæqualibus rotundatis superioribus simplicibus, floribus ternatim umbellatis, umbellis ultimis 3–10-floris, pedicellis fructu longioribus basi articulatis, fructu globoso pericarpio membranaceo, dentibus calycinis brevissimis obtusis, stylo obconico sulcato.

Habitat.—British North Borneo: Gaya Island, *Governor Creagh.*

Arbor 16 pedalis. *Foliola* 6–7 poll. longa, 3–4 poll lata. *Pedicelli* 3–4 lin. longi. *Fructus* 2½ lin. diam.

241. **Viburnum ceanothoides**, *Wright* [Caprifoliaceæ]; fruticosum, ramis teretibus pubescentibus, foliis oppositis petiolatis obcuneatis versus apicem dentatis costa excepta glabris pseudo-flabellatim costatis, cymis multifloris terminalibus, bracteolis parvis hirsutis, floribus parvis, calyce minute 5-dentato, corolla campanulata alba lobis 5 rotundatis, staminorum filamentis prope corollæ basin affixis, antheris exsertis, ovario uniloculari, stylo brevi.

Habitat.—China: Yunnan, Mongtse, mountain ridges, 5500–6000 ft. *W. Hancock*, 47.

Folia 1½ poll. longa, 6 lin. lata. *Inflorescentia* 2 poll. diam. *Corolla* 1 lin. diam.

Readily distinguished by the form of the leaves.

242. **Uncaria grandifolia**, *Baker* [Rubiaceæ]; fruticosa, sarmentosa, ramulis teretibus ferrugineo-pubescentibus, stipulis caducis, foliis brevissime petiolatis magnis oblongis subobtusis basi rotundatis subcoriaceis facie scabris dorso dense persistenteque ferrugineo-pubescentibus,

umbellis densis globosis axillaribus pedunculatis, receptaculo globoso, pedicellis elongatis pubescentibus ovario æquilongis, ovario cylindrico ferrugineo-pubescente 10-costato e medio ad apicem et basin attenuato, calycis tubo supra ovarium brevi infundibulari segmentis ovatis intus hirsutis.

Habitat.—East coast of British North Borneo, *Governor Creagh.*

Folia subpedalia, medio 4–5 poll. lata. *Umbellæ* 5 poll. diam.; pedicelli 12–15 lin. longi. *Calycis* tubus 3 lin. longus; segmenta 2 lin. longa. *Corolla* ignota.

Near *U. sclerophylla*, Roxb.

243. **Vaccinium setosum,** *Wright* [Vacciniaceæ]; frutex humilis, cauli tereti rugoso setis brunneis vestito, foliis ovatis coriaceis marginibus recurvatis crenatis supra glabris subtus sparse brunneis pilosis, racemis multifloris prope caulis apicem confertis, bracteis rubris late lanceolatis acutis ciliatis, calycis segmentis 5 triangularibus ciliatis, corolla urceolata extus subglabra intus tomentosa segmentis 5 brevibus subulatis, staminibus 10 liberis, antheris dorso biaristatis, ovario 5-locularis, stylo staminibus æquilongo 5-alato.

Habitat.—China: Yunnan, Mongtse, on a mountain ridge at 6300 ft. *W. Hancock*, 160.

Folia 9 lin. longa, 6–7 lin. lata. *Racemi* 1½–2 poll. longi. *Corolla* 2–3 lin. longa.

Differs from *V. retusum*, Hook. f. in its acute leaves with crenate margins and from *V. griffithianum*, Wight, in its denser racemes and smaller bracts.

244. **Primula barbicalyx,** *Wright* [Primulaceæ]; humilis, foliis membranaceis ovatis dentato-sinuatis ciliatis pilosis, petiolo laminæ æquilongo dense piloso, pedunculo brevi, floribus 2–5 umbellatim dispositis, pedicellis elongatis, calyce campanulato extus (præsertim basi) pilis brunneo-purpureis vestito lobis 5 triangularibus, corolla dilute lilacina longe tubulosa segmentis 5 bilobatis.

Habitat.—China: Yunnan, Mongtse, limestone crags at 8700 ft. *W. Hancock*, 109.

Folia 1–1¼ poll. longa, ¾–1 poll. lata; *petioli* 1 poll. longi. *Pedunculi* 1 poll. longi vel breviores; *pedicelli* 6–9 lin. longi. *Calyx* 2 lin. longus. *Corollæ* tubus 5 lin. longus; limbus 6–8 lin. diam.

Resembling *P. Listeri*, King, but differing in having a smaller calyx covered with long brownish-purple hairs and a larger corolla.

245. **Buddleia acutifolia,** *Wright* [Loganiaceæ]; fruticosa, ramis teretibus primum tomentosis, foliis late lanceolatis basi apiceque acutis marginibus serratis supra pubescentibus subtus tomentosis, inflorescentia terminali multiflora paniculata, calycis cupularis extus tomentosi lobis 4 rotundatis, corolla lilacina extus tomentosa tubo elongato recto lobis 4 patulis rotundatis, staminibus 4 paullo infra corollæ faucem insertis, stylo brevi clavato.

Habitat.—China: Yunnan, Mongtse, *W. Hancock*, 143.

Folia 6 poll. longa, 2–2½ poll. lata. *Calyx* 1 lin. longus. *Corolla* 4 lin. longa; limbus 2 lin. diam.

This is near *B. variabilis*, Hemsl. but has the leaves tapering more towards the base and the lateral branches of the panicle longer. The flowers are lavender-coloured and fragrant.

246. **Fagræa spicata**, *Baker* [Loganiaceæ]; fruticosa, glabra, ramulis teretibus, foliis subsessilibus oblongis obtusis coriaceis basi breviter cordatis, floribus in spicas densas terminales breviter pedunculatas dispositis, annulo stipulari brevi truncato, rachi incrassata, calycis tubo campanulato lobis orbicularibus imbricatis tubo brevioribus, corollæ tubo infundibulari lobis parvis ovatis, genitalibus in tubo inclusis.

Habitat.—East coast of British North Borneo, *Governor Creagh.*

Folia subpedalia, 3½–4 poll. lata. *Calyx* 2½ lin. longus. *Corolla* 15–16 lin. longa. *Fructus* ignotus.

Near *F. crassipes*, Benth. and *F. morindæfolia*, Blume.

247. **Fagræa macroscypha**, *Baker* [Loganiaceæ]; arborea, glabra, ramulis validis teretibus, stipulis orbicularibus coriaceis reflexiss persistentibus, foliis distincte petiolatis coriaceis oblongis acutis basi cuneatis, floribus magnis solitariis terminalibus, bracteis magnis oblongis acutis calyce adpressis, calycis tubo oblongo lobis ovatis, corollæ tubo elongato anguste infundibulari limbi lobis ovatis patulis, genitalibus ex tubo exsertis, fructu oblongo-cylindrico calyce persistente æquilongo.

Habitat.—British North Borneo: Kinatabangan, *Governor Creagh.*

Folia 3–4 poll. longa, medio 1½–2 poll. lata. *Calyx* 2 poll. longus. *Corollæ* tubus 5 poll. longus, apice 12–15 lin. diam.; limbi lobi 1½ poll. longi.

248. **Ehretia corylifolia**, *Wright* [Boragineæ]; arborea, foliis oblongo-ovatis acutis basi rotundatis vel subcordatis dentatis utraque molliter tomentosis breviter petiolatis, cymis terminalibus multifloris, calyce profunde 5-partito extus tomentoso segmentis subulatis, corolla alba infundibuliformis segmentis 5 oblongis, staminibus exsertis antheris dorsifixis, stylo corollæ tubus æquilongo bifido.

Habitat.—China: Yunnan, Mongtse, in glens and copses, 5300 ft.; *W. Hancock*, 153.

Folia 3 poll. longa, 2 poll. lata. *Cymæ* 2 poll. diam. *Calyx* 1 lin. longus. *Corolla* 3–4 lin. longa, 5 lin. diam. *Styli* rami 1 lin. longi.

E. macrophylla, Wall. approaches this, but has scabrid leaves and a more lax inflorescence.

249. **Didymocarpus crenata**, *Baker* [Gesneraceæ]; perennis, acaulis, foliis basalibus dense rosulatis lanceolatis acutis conspicue bullatis et crenatis basi rotundatis facie parce pilosis dorso præsertim ad costam magis pilosis, petiolo brevi pilis squamosis densis vestito, scapo gracili paucifloro obscure piloso glanduloso foliis paulo longiore, floribus laxe racemosis, rachi glanduloso-pubescente, pedicellis brevibus ascendentibus, bracteis linearibus persistentibus, calycis glandulosi tubo subnullo segmentis ovatis acutis, corollæ pallide rubellæ tubo infundibulari lobis parvis rotundatis, genitalibus in tubo inclusis.

Habitat.—British North Borneo: Sandakan, *Governor Creagh.*

Folia 4–5 poll. longa, medio 9–10 lin. lata. *Calyx* 1½ lin. longus. *Corolla* 9–12 lin. longa. *Fructus* ignotus.

Near *D. bullatus*, C. B. Clarke in DC. *Monogr. Phanerog.* V. 92.

250. **Vitex holophylla**, *Baker* [Verbenaceæ]; arborea, ramulis tetragonis glabris, foliis distincte petiolatis coriaceis simplicibus oblongis acuminatis integris basi rotundatis utrinque viridibus glabris, cymis

paucifloris congestis dissitis in spicas multas paniculatas dispositis, pedicellis brevissimis velutinis interdum abortivis, bracteis lanceolatis minutis, calyce florifero tubo campanulato dentibus deltoides minutis fructifero valde accrescente ore truncato, corollæ tubo infundibulari extus velutino, fructu magno globoso duro glabro.

Habitat.—British North Borneo: Sandakan, *Governor Creagh.* Gathered previously by *Sir Hugh Low.*

Folia semipedalia et ultra, 3–4 poll. lata. *Calyx* floriferus 1 lin. longus. *Corolla* 3 lin. longa. *Fructus* 8–9 lin. diam.

Very near *V. simplicifolia*, C. B. Clarke, which is also a North Bornean plant.

CCCCXCVIII.—DATE CULTIVATION IN ANTIGUA.

The following correspondence records the promising results of an interesting experiment. There appears every reason to hope that it may in time make an important addition to the fruit resources of our West Indian Colonies.

Colonial Office to Royal Gardens, Kew.

Sir, Downing Street, 18th December 1895.

I am directed by the Secretary of State for the Colonies to transmit to you the accompanying copy of a despatch from the Governor of the Leeward Islands, forwarding a report from the curator of the Botanic Station on date cultivation at Copse Cross Station, and to request that he may be favoured with your observations thereon.

I am, &c.
(Signed) R. H. Meade.

The Director,
Royal Gardens, Kew.

(Copy.)

Governor of the Leeward Islands to Colonial Office.

Government House, Antigua,
Sir, 19th November 1895.

I have the honour to transmit, for the information of the Director of the Royal Gardens, Kew, copy of an interesting report which I have received from the curator of the Botanic Station on the progress of the date cultivation at Copse Cross Station, near English Harbour.

2. Mr. Tillson concludes his report by asking for the advice of the Kew authorities as to the advisability of extending this cultivation.

I have, &c.
(Signed) Geo. Melville,
Administrator.

The Right Honourable
Joseph Chamberlain, P.C.,
&c. &c.

(Enclosure.)

Botanic Station, Victoria Park,
November 12th, 1895.

Sir,

I have the honour to submit to you, for his Excellency the Administrator's information, the accompanying report upon the date cultivation at the Copse Cross Station.

After carefully considering the chances of success, in December 1890 I wrote the Director of the Royal Gardens, Kew, stating my views on the subject, and asked to be supplied with seed of the date of commerce.

In March 1891 I received from Kew a case of selected dates, including the famous Tafilat variety.

From the seed received I raised about 5000 plants, which were offered for sale in the Antigua *Standard*.

Date growing being a new and untried industry and long in producing a return the plants were not taken up.

Plants were put out at the various stations, others sent to the Botanic Stations of Dominica, St. Kitts-Nevis, and Montserrat, and some in exchange to Grenada Botanic Station.

It affords me much pleasure to report that at Copse Cross there are now 86 established date trees, three of which fruited during August of this year, being only 4½ years old.

The English Harbour district seems very favourable to date culture.

The following notes from "Haldane's Sub-tropical Cultivation and Climates" show the value of date cultivations, and the fine growth and early fruiting at Copse Cross are an index of what may be expected under local conditions:—"The yield of a tree in full bearing is from 100 to 200 pounds per annum, but as much as 400 pounds have been got from a single tree." "The tree generally produces eight to 10 bunches of fruit, and the produce of a hectare (2½ acres) of land under this cultivation is about 14,400 pounds of dates." The value of dates in England is, Tafilat, 70*s*. to 84*s*. per cwt.; Egyptian, 28*s*. to 45*s*.; Bussore, 13*s*. to 21*s*. The trees live to a great age and produce fruit till 200 years old."

I have the honour to request that a statement of the progress of the date plots at Copse Cross may be submitted to the Director of the Royal Gardens, Kew, and the advice of Kew obtained as to the advisability, now that we have data to go upon, of importing more seed, and endeavouring to extend date cultivation.

I have, &c.
(Signed) A. G. Tillson,
Curator.

Royal Gardens, Kew, to Colonial Office.

Sir,

Kew, December 23rd, 1895.

I have the honour to acknowledge the receipt of your letter of December 18th (22,148/95), transmitting a copy of a despatch from the Governor of the Leeward Islands, forwarding a report from the curator of the Botanic Station on the progress of date cultivation at Copse Cross Station, Antigua.

2. As far as I know this is the first instance of this palm's fruiting in the West Indies. As the trees are said not to come into *full* bearing till about 10 years, it is a culture which would probably never be taken up unless the Government set the example. It is, however, one which

is, I think, well worth encouraging on a moderate scale, as the fruit would probably meet with a ready sale in the United States market.

3. The success which Mr. Tillson has met with in obtaining fruit from seedlings only 4½ years old is interesting, as under the most favourable circumstances this rarely takes place in less than five years.

Mr. Tillson says nothing as to the quality of the fruit produced. The best kinds of date palms are not raised from seeds but are grown from "suckers."

4. The *Kew Bulletin* for the present year (pp. 161, 162) contains an account of the results of the experimental cultivation of the date palm in Australia. According to the "Annual Progress Report upon State Forest Administration in South Australia for the year 1894–95" (pp. 6, 7), a seedling date palm about eight years old yielded 50 lbs. of fruit of fair quality from eight bunches.

I am, &c.
(Signed) W. T. Thiselton-Dyer.

CCCCXCIX.—MISCELLANEOUS NOTES.

Visitors during 1895.—The number of persons who visited the Royal Gardens during the year 1895 was 1,407,369. That for 1894 was 1,377,588. The average for 1885–94 was 1,416,887.

The total number on Sundays was 536,181 and on week-days 871,188.

The maximum number of visitors on any one day was 13,583 on June 3, and the smallest 104 on November 28.

The detailed monthly returns are given below :—

January	15,026
February	12,607
March	44,612
April	139,995
May	162,784
June	297,994
July	164,672
August	288,420
September	190,318
October	49,630
November	23,402
December	17,909
	1,407,369

Botanical Magazine for December.—The plants figured are: *Streptocarpus Wendlandii, Aloe Luntii, Buddleia Colvilei, Bartholina pectinata,* and *Musa rubra;* all, except the *Buddleia,* from plants cultivated at Kew. The *Streptocarpus,* a South African plant, will be remembered as one of those that flowered so freely on the edge of the central area of the cactus house. The *Aloe* is one of Mr. Lunt's

discoveries in South Arabia. *Bartholina pectinata* is a curious and elegant South African ground orchid, first introduced into cultivation at Kew by Masson upwards of a century ago, and recently by Mr. Harry Bolus, F.L.S., of Cape Town, to whom Sir Joseph Hooker has dedicated the 121st volume of the *Botanical Magazine*, which this number completes. *Musa rubra* was grown from suckers sent from Calcutta to Kew by Dr. King in 1889. It is a slender species, having rosy bracts and pale yellow flowers. The handsome *Buddleia Colvilei* flowered in the rich and interesting garden of William Gumbleton, Esq., at Belgrove, Cork.

Index Kewensis.—The completion of this important work, which is indispensable to any systematic botanist, was announced in the *Kew Bnlletin* for November last (p. 300).

It is important to point out, in order to remedy a misconception which appears to exist amongst many persons who have used the book, that the *Index* is in no sense intended to be a standard of nomenclature, or to represent the views of Kew in the matter. It is nothing more than what it professes to be, an index of published plant names, with references to the works in which they were first promulgated and the countries of which the plants themselves are natives. Where it has been pointed out by competent authority that the names cited are "synonyms" the fact is indicated. As to the remainder no attempt whatever has been made to ascertain their validity. To have done this would have been to have undertaken a task which could not have been completed in any reasonable time, even with the aid of a large staff of skilled botanists.

The expense of preparing the work has been entirely defrayed by the members of the family of the late Charles Darwin. That of printing and publication has been borne by the Oxford Clarendon Press, which has no other means of recouping itself except by the sale of the work. For this reason Kew has not had at its disposal any copies which it could present to other institutions. The price to non-subscribers has now been raised to 10 guineas.

Palm House Terrace.—The condition of the raised flat expanse immediately surrounding the great Palm House has long been felt to be unsatisfactory and unworthy of this fine building. It had been covered with rough gravel which was unpleasant to walk upon and hot and arid to the eye in summer. A defined and kept gravel walk has now been made connecting the different steps and entrances, and the rest of the space has been laid down in turf (which it may be interesting to record has been mostly brought from Whitton Park). The surface of this is unbroken except by a few bold beds of evergreen shrubs or of herbaceous perennials.

Geranium wallichianum as a dye plant.—This is a herb with large blue flowers, native of the Temperate Himalaya at from 7,000 to 11,000 feet. A quantity of the dried roots were sent to Kew by Brigade-Surgeon

(retired) J. E. T. Aitchison, C.I.E., F.R.S., who states there they are largely used as a dye-stuff in Kashmir. They were submitted to J. J. Hummel, Esq., Professor of Dyeing in the Yorkshire College, Leeds, who has very kindly furnished the following report. The use of the plant whether for dyeing or tanning is not indicated in Watts' Dictionary of the Economic Products of India.

PROFESSOR HUMMEL to ROYAL GARDENS, KEW.

The Yorkshire College, Leeds,
December 20th, 1895.

DEAR SIR,

ENCLOSED I now send you samples of calico printed with aluminium and iron mordants and dyed with roots of *Geranium wallichianum* from Kashmir. The dark greys given by the iron mordants, and the pale soiled yellowish tints on the aluminium mordants, show that these roots contain essentially tannin matter unaccompanied by any mordant-dyeing colouring matter. The reddish stain on the unprinted, *i.e.*, unmordanted, parts of the calico indicates that there is also present some red colouring matter for which cotton has a natural attraction, but which must be regarded as of no commercial importance: indeed regarding the roots as a useful tannin matter the presence of this red colouring matter is somewhat objectionable.

In comparison with Sumach and Myrabolans, patterns dyed with which are also enclosed, it would appear that the *G. wallichianum* roots are about equal to the latter as regards amount of tannin matter present, and I have no doubt they could be usefully employed by the dyer for certain purposes either in the form of powder or as an extract, in the same manner as other tannin matters are employed.

I enclose Mr. Proctor's report which gives an analysis of the root, and some remarks as to its suitability for tanning leather, a sample of which tanned by the product accompanies his report.

Yours truly,
(Signed) J. J. HUMMEL.

W. T. Thiselton-Dyer, Esq., G.M.G., C.I.E.,
Director, Royal Gardens, Kew.

[Enclosure.]

Leather Industries Laboratory,
The Yorkshire College, Leeds.
December 14th, 1895.

DEAR PROF. HUMMEL,

The following are the results of our analysis of the root of Kao-ashud (*Geranium wallichianum*) which was sent by Dr. J. E. T. Aitchison to the Museums of Economic Botany at Kew. The sample of root contains 43·5 per cent. of matter soluble in water and, determined by the gravimetric hide powder method, gives—

Tanning matter absorbed by hide - -	25·7 per cent.
Soluble non-tanning matter - -	17·8 ,,
Vegetable fibre and insoluble - -	43·0 ,,
Moisture - - - -	13·5 ,,
	100·0

The colour of the extract is somewhat dark and reddish, but that of leather tanned with it is much brighter than might have been expected from the appearance of the liquor, and there certainly seems no reason

why if the material can be obtained in sufficient quantities it should not form a valuable addition to our tanning materials. The leather produced is somewhat darker but not very dissimilar to that obtained by the use of Canaigre root (*Rumex hymenosepalum*).

Apologising for long delay in reporting to you,

I am, &c.

(Signed) HENRY R. PROCTER.

Recent Presentations to the Herbarium. — Sir Ferdinand von Mueller has presented from time to time specimens of new genera and species described by himself, together with advance proofs or reprints of the descriptions. Dr. G. Haviland, who is working at Kew on his Bornean collections, has given a collection of 200 additional species. Mr. E. A. Elliott has presented a collection of dried plants made by his brother, Mr. C. F. Elliott, an officer of the Indian Forest Department, in Baluchistan and the Punjab. Sir Henry H. Johnston has presented a collection of about 150 species made by Mr. A. Whyte, F.L.S., on Mount Cheradzulu, a part of Sir John Kirk's early collecting grounds. It contained several novelties, though no new generic type. He has since sent a few additional specimens, including a curious new orchid of the genius *Holothrix*, and a new *Cremaspora*, bearing a strong resemblance to coffee. These will shortly be published in the *Bulletin.* Sir Henry Johnston has also intimated his intention of having specimens collected, as far as possible, of the trees of the district. Nothing could be more desired in this direction, because travellers are commonly unable to cope with the difficulties attending the operation. Mr. J. Burtt Davy, formerly a member of the staff, and now at the Berkeley University, California, sent about 170 specimens of Californian plants, chiefly new and critical species. From Mr. J. F. Waby, head gardener in the Georgetown Botanic Garden, British Guiana, Kew has received a collection of Barbados plants. From Mr. J. F. Duthie, Director of the Botanic Department, Northern India, there is another consignment of grasses, nearly 200 in number, in aid of the concluding volume of Sir Joseph Hooker's *Flora of British India.* A small collection of Canadian plants has been received from Mr. J. M. Macoun, Assistant Botanist to the Dominion. Finally, there is a magnificent gift of nearly 1,500 species of Central American plants, from Mr. J. Donnell-Smith, of Baltimore. This is particularly valuable, as Kew is by no means rich in the plants of this region.

Coloured figures of Fungi.—Kew has lately purchased two folio volumes of unpublished coloured drawings of fungi of great merit. There is no clue to the name of the artist, but from the fact of most of the few remarks there are on the names and localities being in the Italian language, there is little doubt that the artist was Italian. The date is less uncertain and the work was doubtless spread over a number of years. The following note accompanies a figure of a specimen of *Polyporus squamosus* eighteen inches in diameter. *Fungo nato ne i Prati de S. Pactoro il Luglio,* 1680. And a figure of *Clathrus cancellatus* bears the inscription "*Ad ripas Tiberis prope Flaminia, meuse 9bris,* 1699. Many of the figures are named in the handwriting of the late Rev.

M. J. Berkeley, and a few in that of the late C. E. Broome. Nothing more is known at Kew of its history. Altogether there are nearly 1,250 figures, most of them beautifully and accurately executed. In vigour of style they resemble Schaeffer's *Icones Fungorum*, though there is no evidence that they served as originals. Indeed that work was not published till 1762–1774.

Robert, Basse, and de Chastillon's Recueil de Plantes.—Kew has acquired by purchase a very fine copy of this magnificent collection of engravings of plants. Some copies were issued without a title-page, but Pritzel (*Thesaurus Literaturæ Botanicæ*, ed. 1. n. 8362) says "In exemplari bibliothecæ Sherardianæ Oxonii asservatæ tituli adsunt: *Estampes pour servir à l'Histoire des Plantes.* Partie i. et ii. Paris, de de l'imprimerie royale, 1701. He also gives the following title: *Recueil de Plantes dessinées et gravées par Ordre du Roi Louis XIV.*, Paris, 1701. The size he gives as 16 by 12 inches, but that is the size of the plates employed for the engravings. The Kew copy is 25½ by 19 inches. Pritzel adds: "Brunet de hac collectione monet: Recueil parfaitement éxecuté et dont on recherche encore un peu les anciennes épreuves. L'ouvrage parut d'abord sans explication; mais Monsieur Buisson a fait imprimer, vers 1780, un frontispice avec des éclaircissements sur ce recueil et une table des 319 planches; le tout formant 20 foll." The engravings are not only artistically but botanically good, and, what was rare at that date, the figures are supplemented by enlarged analyses of the flowers, and sometimes of the seed and young seedlings. The designations are the phrases, or abbreviations of them, employed by the writers of the period, such as Bauhin and Thunberg, who are cited in each case, and the arrangement is alphabetical, based on the first word.

Ipecacuanha in Southern India.—The *Kew Bulletin* for 1888 contained (pp. 123–128) an account of the various attempts which have been made to establish the cultivation of the plant producing this valuable drug in the East Indies. The annual report of Mr. M. A. Lawson, Government Botanist and Director of Government Cinchona Plantations to the Madras Government records the result recently obtained in Southern India:—

"The following interesting report has been sent by Mr. J. R. Malcolm of the Vallera Mullays:—

"In reply to yours of the 25th, I am sorry that I cannot oblige you with any ipecacuanha seed. As the plants were not getting on owing to the heavy drip from the forest trees, I took them all up and cut off the roots, obtaining 20 lb. dried only. I replanted what was left, under light artificial shade, and they seem to like it, as all are throwing shoots. The small parcel of root was sent home, and it will interest you to know that it was highly reported on. Messrs. Figgis and Co. say 'The little lot we sold for you (Messrs. Parry and Co.) was very fine picked root, nice colour, flavour, &c.' It really was not picked at all. I gathered everything I could find in the ground. It sold for 5*s.* 4*d.* per lb., the best mattogrosso fetching 5*s.* 6*d.* per lb."

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 110.] FEBRUARY. [1896.

D.—COLD STORAGE OF FRUIT.

The discovery of satisfactory methods for storing fruit either at home or in the colonies is obviously a matter of great importance. At home it would counteract the effect of a "glut," and enable a better price to be obtained for the crop by allowing it to be placed upon the market over a longer interval. In the colonies it would facilitate the export of fruit from the southern hemisphere to the northern, and even *vice versâ*, so as to give to either a continuous supply of fruit all the year round.

In the *Kew Bulletin* for 1895 (pp. 31–32) an account was given of the method of storing home-grown fruit. In that for 1894 (pp. 187–189), the experiments made in cold storage by the Department of Agriculture and Forests in New South Wales were described.

The following further description of more detailed experiments on the cold storage of fruit is extracted from the eighth *Annual Report on Experimental Farms* (1895), presented to the Canadian Government by William Saunders, Esq., F.L.S., Director, Dominion Experimental Farms, Ottawa (pp. 103–105) :—

Nova Scotia has marked an era in her horticultural progress by the establishment of a school of horticulture, under the control of the Provincial Fruit Growers' Association, and the directorship of Prof. E. E. Faville. This is the only school of its kind in Canada, if not in America.

The great success scored by Canada in her exhibit of fruits at the opening of the World's Columbian Exposition, in May 1893, was, in a large measure, due to the cold storage facilities afforded by the World's Fair authorities, and but for the unfortunate burning of the storage building, and with it a great deal of Canadian fruit, the display would have been much more extensive and varied. The fact, however, that summer and autumn apples, like Duchess of Oldenburg, St. Lawrence, and Wealthy, were placed in good condition upon the tables during the months of May and June, gave food for thought to the thinking mind, and raised the question of the usefulness of the system to the commercial grower and the shipper of fruit.

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It is well known that cold storage and refrigerator cars have played an important part for some years in the economy of marketing the great Californian fruit product. It is also well known that large dealers in great fruit markets, like Chicago and New York, have used in common with produce and commission men cold storage warehouses, in which to hold perishable fruit during periods of low prices owing to over-stocked markets. Our information on these lines has, however, been rather vague and unsatisfactory.

With the object of ascertaining some facts based upon personal experience, preliminary experiments were instituted on this line during the present season.

Arrangements were made with the Montreal Cold Storage Company for storing packages of the different fruits as they matured. In this connection I beg to acknowledge the courtesy and generous assistance rendered by the managers of this company, Messrs. T. J. Chisholm and D. G. McGillis, in aiding me in carrying out the experiments. Although sufficient time has not elapsed since the initiation of the experiments to permit the collection of information of value regarding the later fruits, yet its degree of usefulness in marketing the earlier and more perishable fruits has been, if not actually defined, quite clearly indicated. The unusual amount of heat and drought in the districts from which the fruit was procured undoubtedly injured the keeping qualities of the fruit under trial. Last year Wealthy apples grown at Ottawa kept in a cold cellar until May. This year many have already decayed and the remainder are very soft, under the same conditions.

Peaches.

Mountain Rose and Early Crawford peaches, wrapped in tissue paper, packed in 20-pound baskets and stored in an atmosphere of 34 degrees Fahr. on September 5th, remained in good condition till October 1st; soon after this they began to show signs of discoloration. The same varieties under the same conditions, without wrappers, on October 1st showed 5 to 6 per cent. decayed. On October 10th 30 per cent. of Mountain Rose, wrapped, had decayed; of Mountain Rose, unwrapped, fully 75 per cent. were rotten. At this date Early Crawfords were in a relatively better condition, as follows:—Wrapped, 10 per cent. decayed; unwrapped 15 per cent. The decayed fruit did not fall away as is usually the case, but instead lost flavour and colour, while retaining its form. The discoloration began first near the stone and worked outwards. Up to October 1st the flavour was umimpaired, but after this it deteriorated rapidly. I may say the fruit was well ripened before storing took place. Such fruit will not keep more than a few days when taken out of cold storage.

Plums.

Lombard and Monroe plums were stored in baskets, the fruit being wrapped and unwrapped as in the case of the peaches. They were stored on September 6th in a temperature of 34 degrees Fahr., which was maintained uniformly throughout.

The results gained on the whole do not differ materially from those with peaches, and indicate that stone fruits as a class cannot be profitably stored for a longer period than three weeks, and that in the case of fruit originally well ripened, probably not so long; after this period there is a rapid deterioration both in flavour and firmness.

Pears.

Bartlett.—Fully ripe, wrapped, packed in baskets, stored on September 1st, began to decay November 15th. The same unwrapped were badly decayed on that date.

Bartlett.—Fully ripe, wrapped and packed in cases holding from 50 to 75 pears each, were in good condition on December 1st. Flavour unimpaired. On December 10th 25 to 30 per cent. were rotten ; on December 15th fully 50 per cent. had decayed. Flavour somewhat impaired.

Flemish Beauty.—Fully matured, wrapped and packed in baskets, decayed earlier than Bartlett, beginning to show signs of rotting on October 15th. The same variety unwrapped began to decay on October 6th.

Flemish Beauty.—Fully matured, wrapped and packed in kegs, were in good condition up to November 1st ; they decayed rapidly after this and few remained by December 10th.

The unwrapped in kegs had entirely "wasted" by December 6th.

Beurré Clairgeau.—Wrapped in baskets, were in good condition when last examined, December 31st. The same unwrapped were also in good condition on the same day.

Beurré d'Anjou.—Wrapped and packed in kegs and boxes, were also in good condition on December 10th ; and the same may be said of Duchess.

It will be seen that matured Bartlett and Flemish Beauty cannot be safely kept in storage after November 15th or at latest December 1st.

Apples.

Trial packages of three varieties of these were sent to the storage warehouse from the Central Farm as they ripened.

Tetofsky.—Wrapped, packed in baskets, were in good condition with flavour unimpaired up to November 15th, when they commenced to discolour and lose flavour. On December 10th the greater proportion were decayed and unfit for use. There was a little difference in favour of the wrapped fruit, but the improvement was not so marked as in the case of the pears.

Duchess.—Packed the same way, began to decay on December 10th ; the same variety unwrapped showed 8 to 10 per cent. of rotten fruit at this date.

Wealthy and Colvert.—Both in boxes and barrels, unwrapped, are of course perfect at this date, December 31st. Summer apples, in common with other soft fruits, kept best when wrapped in tissue paper and put up in wooden packages.

Grapes.

Sample baskets of Lindley, Delaware, and Niagara grapes, stored on September 27th, are at this date, December 20th, in good condition.

The deductions which may be drawn from the results of this preliminary trial in the preservation of fruits by cold storage may be summarized as follows :—

1. Fruit for storage should be picked when fully grown, but before it has thoroughly matured.
2. Early pears, peaches, and the larger varieties of plums should be wrapped separately in tissue paper.
3. Tight wooden boxes are the most satisfactory packages for storing and handling. When baskets are used they should be provided with strong "veneer" covers.
4. Stone fruits, such as peaches and plums, under ordinary circumstances should not be held for a longer period than two or three weeks.
5. The marketing season for early pears and apples may be extended from 30 to 60 days, and under favourable circumstances for a longer period.
6. The outcome of experiments with fall and early winter varieties of apples and pears, including samples of grapes, yet remains to be developed.

* * * * * *

I have, &c.,
JOHN CRAIG,
Horticulturist.

DI.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECADES XXVI., XXVII.

THROUGH Mr. H. N. Ridley, director of the Gardens and Forest Department of the Straits Settlements, Kew has received a small collection of dried plants, made and presented by Mr. A. H. Everett, a gentleman engaged more especially in collecting birds and insects, whom the former had induced to collect plants. The plants in question are from the previously unexplored Lompo-Battang, or Bonthain Peak, in South Celebes. This peak rises to a height of about 10,200 feet, and the plants were obtained from elevations of 7,000 to 10,000 feet. Mr. Everett's specimens are mostly good so far as they go, but he ascended the peak in October when few of the plants were either in flower or in fruit; consequentiy a number which are evidently new cannot be described. Among these are two species of *Vaccinium*, a *Leptospermum*, a *Freycinetia*, and four species of *Elatostema*. Several prove to be identical with species inhabiting Mount Kinabalu, North Borneo, as *Ranunculus Lowii*, *Potentilla leuconota*, *Leucopogon suaveolens* and *Quercus Havilandii*. Interesting among grasses is a variety of the Japanese *Festuca parvigluma*, to which, with fuller material, it may be found desirable to give specific rank. There is also a *Danthonia* closely allied to the Australian *D. penicillata* ; and there are 30 species of vascular cryptogams, but no new species. *Lycopodium clavatum*

indicates the existence of a strictly temperate zone in Celebes. Among the novelties described in the following decade, *Trachymene celebica* is the most striking and one of the most interesting in relation to the geographical distribution of the genus, which, with the exception of one species in North Borneo, was not previously known out of Australasia.

251. **Clematis Everettii,** *Hemsl.* [Ranunculaceæ]; per petiolos scandens, præter flores glabra, caulibus tenuiusculis striatis, internodiis quam folia nunc brevioribus nunc longioribus, foliis simplicibus longe petiolatis subcoriaceis (adultis non visis) cordatis integerrimis obtuse gradatim acuminatis subquinquenerviis nitidis, floribus parvis vel minutis (bene evolutis non visis) axillaribus solitariis vel 2–3 aggregatis brevissime pedunculatis, sepalis 6 crassis dense ferrugineo-pubescentibus.

Habitat. — South Celebes: Bonthain Peak at 10,000 ft., *A. H. Everett*, 5.

Folia cum petiolis 5–7 poll. longa, 2½–3½ poll. lata. *Pedunculi* (vix evoluti?) circiter semipollicares. *Alabastri* 3–4 lin. diametro.

The simple, shining, 5-nerved leaves, and very small flowers of six sepals sufficiently characterise this species, which is near *C. smilacifolia*, Wall.

252. **Begonia (§ Haagea) bonthainensis,** *Hemsl.* [Begoniaceæ]; caulescens, omnino glabra vel cito glabrescens, ramosa, ramulis vix carnosis flexuosis ad nodos incrassatis, foliis longe petiolatis siccis tenuissimis oblique ovatis semicordatis multilobulatis simul denticulatis vel duplicato-dentatis acuminatis a basi 7–9-nerviis, pedunculis axillaribus quam folia multo brevioribus sæpius bifloris interdum plurifloris, floribus masculinis mediocribus distincte pedicellatis, sepalis 2 late ovalibus vel suborbicularibus, staminibus numerosis filamentis liberis filiformibus inæquilongis, antheris clavatis connectivo inappendiculato, floribus femineis non visis, capsula subæqualiter anguste trialata apice truncata.

Habitat. — South Celebes: Bonthain Peak at 7000 to 10,000 ft., *A. H. Everett*, 34.

Folia absque petiolo 3–6 poll. longa, petiolis 2–4 poll. longis. *Inflorescentia* 3–4 poll. longa. *Sepala* circiter 9 lin. longa et 6–7 lin. lata. *Capsulæ* 8–9 lin. latæ et 6 lin. longæ.

253. **Trachymene celebica,** *Hemsl.* [Umbelliferæ]; robusta, caudice crasso ut videtur prostrato coma foliorum hornotinorum confertorum terminante, caulibus floriferis erectis e basi comæ foliorum ortis sæpius trichotomis petiolisque pilis longissimis patentibus atrorubris (saltem in siccis) vestitis, foliis radicalibus longe petiolatis crassis herbaceis mollibus utrinque dense appresseque hirsutis vel fere strigosis circumscriptione rotundatis basi cordatis sæpissime alte 6-lobatis lobis plus minusve lobulatis simul crebre denticulatis caulinis paucis ad ramificationes similibus sed minoribus breviter petiolatis magis alte lobatis, pedunculis crassiusculis, umbellis subunisexualibus multiradiatis, radiis umbellarum feminearum crassiusculis rigidis confertissimis, involucri bracteis lineari-subulatis ciliato-fimbriatis radios æquantibus, calycis dentibus minutissimis, petalis conspicuis oblongis apiculatis, fructu cordiformi lævi minute punctato, carpellis valde lateraliter compressis oblique oblongis vel suborbicularibus marginatis, vittis nullis, stylis elongatis, gynophoro indiviso.

Habitat.—South Celebes: Bonthain Peak at 10,000 ft., *A. H. Everett*, 74.

Caules floriferi 12–15 poll. alti. *Folia* $1\frac{1}{2}$–$3\frac{1}{2}$ poll. diametro, radicalium petiolis 3–6 poll. longis. *Radii* 4–6 lin. longi. *Carpella* $2\frac{1}{2}$–3 lin. longa.

254. **Ophiorrhiza pileoides**, *Hemsl.* [Rubiaceæ]; repens, radicans, pubescens, caulibus elongatis gracillimis pilosulis, foliis parvis distincte petiolatis membranaceis lanceolatis vix acutis sæpius undulatis supra cito glabrescentibus subtus pallidioribus ut in margine pilis paucis longiusculis obsitis, pedunculis pseudoterminalibus brevissimis 1-3-floris, capsulis truncatis bracteolis angustissimis parce ciliolatis subtentis.

Habitat.—South Celebes: Bonthain Peak, at 7000 to 10,000 ft., *A. H. Everett*, 31.

Caules usque ad 10 poll. longi. *Folia* 5–10 lin. longa. *Capsulæ* 2–3 lin. latæ.

This is similar to Beccari's 603 from Western Sumatra, but that is a glabrous plant.

255. **Senecio Everettii**, *Hemsl.* [Compositæ]; fruticulus vel herba nana, erecta, lignescens, ferrugineo-pubescens, ramulis graciliusculis, internodiis brevissimis, foliis crassiusculis chartaceis sessilibus ovato-oblongis infra medium subito constrictis angustis basi auriculatis grosse crenatis venis obscuris, capitulis homogamis discoideis paucis parvis paucifloris corymbosis breviter pedunculatis, corymbis terminalibus, involucri ecalyculati bracteis uniseriatis ferrugineo-pubescentibus linearibus vix acutis quam flores paullo brevioribus, corollæ alte lobatæ glabræ tubo brevi tenuissimo lobis angustissimis, styli ramis truncatis penicillatis, achæniis (maturis non visis) cylindricis striatis glabris.

Habitat.—South Celebes: Bonthain Peak at 10,000 ft., *A. H. Everett*, 87.

Folia $1\frac{1}{2}$–2 poll. longa, 5–10 lin. lata. Bracteæ circiter 3 lin. longæ.

256. **Scævola similis**, *Hemsl.* [Goodeniaceæ]; *S. oppositifoliæ* arcte affinis et persimilis sed foliis distincte denticulatis floribus tetrameris filamentis glabris; præter foliorum axillas barbatas et inflorescentiam glabra vel cito glabrescens, ramulis gracillimis viridibus, foliis oppositis graciliter breviterque petiolatis tenuissimis lanceolatis longe acuminatis basi rotundatis remote calloso denticulatis, pedunculis axillaribus brevissimis sæpe trifloris, floribus parvis per anthesin sessilibus tetrameris (an semper ?), calycis dentibus minutis crassis ovato-oblongis obtusis glabris, corollæ extus dense pubescentis lobis æqualibus intus infra medium hirsutis, filamentis glabris, ovario pubescente, stylo crasso glabro, stigmate barbato.

Habitat.—South Celebes: Bonthain Peak, at 7000 to 10,000 ft., *A. H. Everett*, 58 in part.

Folia cum petiolo 2–3 poll. longa. *Flores* $3\frac{1}{2}$–4 lin. longi.

This belongs to a small group of closely allied species—*S. oppositifolia*, Roxb., *S. amboinensis*, Miq., and *S. novoguineensis*, Schum., inhabiting Ternate, Amboina and New Guinea respectively.

257. **Gentiana lateriflora**, *Hemsl.* [Gentianaceæ]; perennis ? glabra, caulibus erectis vel adscendentibus crassiusculis ramosis, foliis crassius-

culis basi connatis internodos breves omnino vel in parte vaginantibus anguste lanceolato-oblongis obtusis, floribus mediocribus ad apices ramulorum lateralium solitariis subsessilibus, calycis lobis crassiusculis linearibus subacutis recurvis, corollæ cylindricæ lobis brevibus ovatis acutis erectis dentibus parvis deltoideis alternantibus, fauce nuda, staminibus inclusis filamentis deorsum leviter dilatatis, capsula longe stipitata, seminibus oblongis vel ovoideis insigniter reticulatis.

Habitat.—South Celebes: Bonthain Peak at 10,000 ft., *A. H. Everett*, 78.

Planta 3–9 poll. alta. *Folia* 6–18 lin. longa. *Flores* circiter 15 lin. longi.

258. **Strobilanthes Everettii**, *Rolfe*; caulibus puberulis foliis petiolatis lanceolatis v. elliptico-lanceolatis acuminatis crenatis membranaceis strigulosis supra viridibus subtus glaucis, spicis terminalibus laxis paucifloris, floribus alternis subsessilibus, bracteis lanceolatis herbaceis, calycis profunde 5-partiti lobis linearibus subobtusis pubescentibus pilis divaricatis, corollæ tubo brevi fauce ampliato lobis rotundatis apice bilobatis, staminibus 4, capsulis pubescentibus tetraspermis, seminibus parce hirsutis.

Habitat.—South Celebes: Bonthain Peak, at 7000 ft., *A. H. Everett*, 28.

Folia 1–4 poll. longa, $\frac{1}{4}$–$1\frac{1}{2}$ poll. lata; petioli 1–5 lin. longi. *Bracteæ* 5–9 lin. longæ. *Calyx* 4–6 lin. longus. *Corolla* 1 poll. longa. *Capsula* 6 lin. longa.

Much resembling the Himalayan *S. divaricatus*, T. And., to which it is apparently most allied.

259. **Loranthus (Dendrophthoe) celebicus**, *Hemsl.* [Loranthaceæ]; glaber, ramulis floriferis gracillimis crebre lenticellatis, internodiis quam folia multo brevioribus, foliis omnibus oppositis tenuiter coriaceis distincte petiolatis lanceolatis utrinque longe attenuatis acutis venis immersis inconspicuis, floribus gracillimis fasciculatis ternis sessilibus, pedunculis paucis brevibus secus pedunculos communes axillares racemosis, racemis quam folia dimidio brevioribus, florum fasciculis tribracteolatis, bracteolis brevibus latis rotundatis margine scariosis erosis, calyce truncato margine scarioso, corolla anguste cylindrica recta.

Habitat.—South Celebes: Bonthain Peak, 7000–10,000 ft., *A. H. Everett.*

Folia 2–$3\frac{1}{2}$ poll. longa, 6–12 lin. lata. *Pedunculi communes* 9–12 lin. longi. *Fasciculorum pedunculi* $1\frac{1}{2}$–2 lin. longi. *Flores* 12–14 lin. longi.

Near *L. stenopetalus*, Oliv. in Hooker's *Icones Plantarum*, t. 1223.

260. **Podocarpus celebica**, *Hemsl.* [Coniferæ]; species *P. affini* et *P. ferrugineæ* similis, a priore differt foliis alternis a posteriore differt foliis tenuioribus acutisque; ramulis ultimis gracillimis pallide viridibus, foliis alternis distichis tenuibus confertis taxoideis angustissimis acutissimis rectis vel leviter falcatis supra subnitidis subtus opacis pallidioribus. . . . .

Habitat.—South Celebes: Bonthain Peak, at 7000–10,000 ft., *A. H. Everett*, 35.

Folia circiter pollicaria, $1\frac{1}{2}$–2 lin. lata.

261. **Cyathea dulitensis**, *Baker.* [Filices]; caudice brevi, stipitibus dense cæspitōsis elongatis brunneis superne nudis prope basin paleis magnis patulis lineari-subulatis membranaceis brunneis præditis, frondibus oblongo-lanceolatis bipinnatis crassis rigide coriaceis utrinque viridibus glabris nudis, rachi brunneo subnudo, pinnis lanceolatis ad basin pinnatis inferioribus breviter petiolatis infimis reductis deflexis, pinnulis lineari-oblongis subintegris margine revolutis infimis liberis ad costam adnatis, venulis obscuris immersis erecto-patentibus furcatis, soris uniseriatis inter costam et marginem medialibus, indusio campanulato glabro persistente fragili irregulariter rupto.

Habitat.—Mount Dulit, Sarawak, Borneo, *Dr. Hose*, 308; collected by Mr. Charles Hose.

Caudex pedalis. *Stipites* semipedales. *Lamina* pedalis, 5–6 poll. lata, pinnis 1 poll., pinnulis 2 lin. latis.

262. **Lindsaya (Eulindsaya) Natunæ**, *Baker.* [Filices]; caudice breviter repēnte, stipitibus contiguis elongatis nudis pallide brunneis facie sulcatis, frondibus deltoideis bipinnatis membranaceis utrinque viridibus glabris nudis, rachi nudo pallide brunneo, pinnis 3–4-jugis lanceolatis subsessilibus, pinnulis multijugis crebris sessilibus dimidiatis margine inferiore recto integro margine superiore lobato, venis simplicibus laxis perspicuis inferioribus furcatis, soris oblongis ad apices loborum impositis, indusio glabro persistente.

Habitat.—Natuna island, midway between North Borneo and the Malay peninsula, *Dr. Hose*, 315; collected by Mr. Ernest Hose.

Lamina pedalis. *Pinnæ* 4–5 poll. longæ, 8–9 lin. latæ, pinnulis centralibus 4 lin. longis, 2 lin. latis.

Near *L. guianensis*, Dryand.

263. **Asplenium (Euasplenium) Gregoriæ**, *Baker* [Filices]; caudice erecto, paleis basalibus densis ascendentibus lanceolatis membranaceis sordide brunneis, stipitibus nudis elongatis, frondibus simplicibus lanceolatis acuminatis integris subcoriaceis utrinque viridibus glabris, venis laxis erecto-patentibus simplicibus vel furcatis, soris brevibus erecto-patentibus ad marginem haud attingentibus, indusio angusto glabro viridi persistente.

Habitat.—Madagascar, near Inantasana, *Mrs. Frank Gregory*; collected in 1855.

Stipites 2–3 poll. longi. *Lamina* 3–4 poll. longa, infra medium 8–9 lin. lata. *Sori* centrales 3–4 lin. longi.

Near A. *Gautieri*, Hook.

264. **Asplenium (Euasplenium) microxiphion**, *Baker* [Filices]; caudice erecto, paleis basalibus densis lanceolatis membranaceis sordide brunneis, stipitibus gracilibus cæspitosis brevibus nudis, frondibus simplicibus lanceolatis integris acuminatis subcoriaceis utrinque viridibus glabris ad basin attenuatis, venis erecto-patentibus laxe dispositis simplicibus vel furcatis, soris linearibus ad marginem haud attingentibus, indusio membranaceo glabro persistente.

Habitat.—Natuna island, *Dr. Hose*, 322; collected by Mr. Ernest Hose.

Stipites 1–2 poll. longi. *Lamina* 6–8 poll longa, medio 4–7 lin. lata. *Sori* 2–2½ lin. longi.

Near *A. ensiforme*, Wall.

265. **Asplenium (Euasplenium) Natunæ**, *Baker* [Filices]; caudice erecto lignoso, paleis basalibus densis erectis lanceolatis membranaceis sordide brunneis, stipitibus elongatis brunneis ad apicem minute paleaceis, frondibus simplicibus integris lanceolatis rigide coriaceis basi angustatis facie glabris dorso minute paleaceis, venis crebris obscuris immersis ad marginem productis, soris linearibus ad marginem haud productis, indusio glabro persistente.

Habitat.—Natuna island, *Dr. Hose,* 321; collected by Mr. Ernest Hose.

Stipites 4–6 poll. longi. *Lamina* pedalis vel sesquipedalis, medio 12–21 lin. lata. *Sori* 5–6 lin. longi.

Near *A. serratum*, Linn.

266. **Nephrodium (Eunephrodium) oosorum**, *Baker* [Filices]; stipitibus nudis elongatis griseis pubescentibus, frondibus oblongo-lanceolatis bipinnatifidis subcoriaceis utrinque pubescentibus rachi nudo pubescente, pinnis multijugis sessilibus lanceolatis ad medium pinnatifidis infimis centralibus æquilongis, lobis ovato-lanceolatis crenulatis leviter falcatis, venulis simplicibus erecto-patentibus perspicuis 10–12-jugis, soris oblongis inter costam et marginem medialibus, indusio membranaceo persistente pubescente.

Habitat.—British North Borneo, near Gaya, *Dr. Hose*, 334.

Caudicem non vidi. *Stipites* pedales. *Lamina* 1½–2 pedalis, 6–7 poll. diam. *Pinnæ* centrales 3–4 poll. longæ, 7–8 lin. latæ, lobis basi 1 lin. latis.

Near *N. invisum*, Carruth., from which it differs in its oblong sori.

267. **Nephrodium (Sagenia) Everettii**, *Baker* [Filices]; stipitibus gracilibus elongatis nudis castaneis, frondibus deltoideis membranaceis glabris utrinque viridibus ad alam angustam pinnatifidis, pinnis bijugis lanceolatis vel oblongo-lanceolatis acuminatis integris basi confluentibus infimis maximis, venis primariis ad marginem productis arcuatis parallelis, venulis in areolis parvis copiosis venulis liberis inclusis anastomosantibus, soris sparsis copiosis parvis glabris superficialibus, indusio membranaceo glabro persistente.

Habitat.—Natuna island, *Dr. Hose*, 332; collected by Mr. A. H. Everett.

Caudicem non vidi. *Stipites* 7–8 poll. longi. *Lamina* 9–10 poll. longa et lata, segmentis primariis, deorsum 1–2 poll. latis.

Near *N. ternatum*, Baker.

268. **Polypodium (Eupolypodium) Newtoni**, *Baker* [Filices]; caudice erecto, paleis basalibus lanceolatis brunneis membranaceis, stipitibus brevissimis nudis, frondibus linearibus glabris elasticis viridibus simpliciter pinnatis, rachi nigrescente, pinnis alternis multijugis inæquilateraliter deltoideis obtusis latere inferiore productis inferioribus sensim minoribus, venâ centrali pinnarum nigrescente simplici ad apicem haud producta, soris globosis superficialibus ad basin pinnarum solitariis.

Habitat.—Clarence peak, Fernando Po, alt. 8000–9000 ft., on the stems of *Erica arborea*, *Newton*.

Lamina 1½–2 poll. longa, medio 1½–2 lin. lata.

Near the Jamaican *P. exiguum*, Griseb.

269. **Polypodium (Phymatodes) cyclobasis,** *Baker* [Filices]; frondibus sessilibus basibus sterilibus orbicularibus valde imbricatis rigide coriaceis venis perspicuis in areolis copiosis hexagonis copiosis anastomosantibus supra basin linearibus integris obtusis ad basin sensim angustatis, soris globosis superficialibus inter costam et marginem irregulariter 1–2-seriatis.

Habitat.—North-east New Guinea: 1894, *Rev. C. E. Kennedy;* received from Sir F. von Mueller. Stirling range, ascending to 1500 ft., *Micholitz;* received from Herr Kränzlin.

Laminæ basi sterilis 3–4 poll. longa et lata; apex fertilis pedalis, medio 4 lin. lata. *Sori* 1 lin. diam.

A most distinct species, with fronds combining an entire linear fertile tip, with an orbicular sessile drynarioid base.

270. **Acrostichum (Elaphoglossum) clarenceanum,** *Baker* [Filices]; caudice breviter repente, paleis basalibus densissimis linearibus brunneis membranaceis, stipitibus brevibus ad apicem paleis linearibus pallide brunneis membranaceis squarrosis præditis, frondibus sterilibus lineari-oblongis integris obtusis subcoriaceis basi angustatis utrinque paleis copiosis ovato-lanceolatis vel lanceolatis acuminatis membranaceis brunneis adpressis præditis, venis erecto-patentibus obscuris immersis simplicibus vel furcatis, frondibus fertilibus ignotis.

Habitat.—Clarence peak, Fernando Po, alt. 6000–7000 ft., on trees, *Newton.*

Stipites $1\frac{1}{2}$–2 poll. longi. *Lamina* sterilis 3–4 poll. longa, medio 9–10 lin. lata.

Near *A. spathulatum*, Bory.

DII.—DOMINICA.

This picturesque and interesting island has occupied a good deal of attention of late years. In spite of its fertile soil and healthy climate its resources are still quite undeveloped. At the present moment its condition is such as to cause grave concern both at home and in the Presidency itself. A reference to the information published from time to time in the *Kew Bulletin* was given in the volume for 1894 (pp. 405–410).

A general review of the agricultural resources of Dominica with an account of the establishment of a Botanic Station in the island will be found in a Report prepared by the Assistant Director of Kew, after his visit to the island in 1890 (*Kew Bulletin*, 1891, pp. 115–119).

Very valuable information of later date is contained in the Report of the Royal Commission appointed to hold an inquiry in the island in 1893. This was prepared by the late Sir Robert G. C. Hamilton, K.C.B. An extract from this Report with an appreciative account of the work done at the Botanic Station in promoting local industries is published in the *Kew Bulletin*, 1894 (pp. 405–410).

The following despatch from the Secretary of State for the Colonies published in the *Dominican* of December 12, 1895, shows that efforts

are being made to grapple with the situation and place the finances of the island on a more satisfactory footing :—

Administrator's Office, Dominica,
December 6, 1895.

The following Despatch from the Right Honourable the Secretary of State to his Excellency the Governor-in-Chief is published for general information :—

Sir, Downing Street, November 19, 1895.

The serious financial position of Dominica has for some time engaged my serious attention. It appears that with a funded debt amounting to 70,900*l*. and an annually recurring deficit, a further sum of about 10,000*l*. is urgently required to pay off the floating debt, and to furnish a working balance, and that there is urgent need for certain public works, viz., the repair of the Infirmary, the re-building of the Roseau Jetty, the repair of the Court House, the construction of bridges, and completion of existing roads, the aggregate cost of which is estimated to be about 5,000*l*.

2. I am at the same time aware of the universal testimony which is borne to the natural richness of the island, and of the absolute necessity of roads or railways for its development; and I have had before me the late Sir Robert Hamilton's Report and the subsequent correspondence.

3. I am satisfied that at the present time the financial position of the Presidency does not admit of its undertaking fresh liabilities in the shape of a further loan for the construction of roads or railways, and that on the other hand without better communications and the opening up of the rich districts at present undeveloped on account of their inaccessibility population will continue to leave the island, and that capital will flow out of it instead of into it with the result of diminishing revenue, and general decadence.

4. I have, therefore, further considered the question of affording Imperial assistance to Dominica, and while I concur in my predecessor's view that any actual claim to such assistance founded on the receipt by the Imperial Treasury of the proceeds of the sales of lands in 1765 to 1773 is too remote to be considered now, I think that this circumstance affords some justification for exceptional treatment.

5. Any such assistance, in whatever form, will necessarily require the consent of the Lords Commissioners of the Treasury, and of Parliament, and until that consent is obtained it is impossible for me to pledge myself in any way; but I may say that my desire is to assist the Presidency in developing its undoubtedly rich resources, and to help to place it on a sound financial basis.

6. Before, however, I can be in a position to ask such assistance I must know that the Legislature of Dominica, as I have no doubt will be the case, are prepared to do their part towards the attainment of these objects, and more particularly that the Legislature are willing to vote the additional taxation which is required to make the revenue balance the expenditure, and to transfer the expenditure of the town of Roseau to a Town Board to be met by municipal taxation as recommended by Sir R. Hamilton.

7. As some time must, in any case, elapse before any decision can be arrived at as to the measures to be adopted, it will be necessary to make temporary provision for the 15,000*l*. which is immediately required.

In framing the estimates for 1895 the Administrator should provide for a sufficient revenue to cover the ordinary expenditure, but the

question of providing for the repayment of the floating debt and for the cost of the works which are mentioned in paragraph 1 of this Despatch may be left in abeyance for the present and the introduction of a Bill providing the raising of a loan by Treasury Bills as authorised by my Despatch No. 258 of the 8th of October should be deferred.

In order to save time I am sending a duplicate of this Despatch to the Administrator of Dominica.

I have, &c.
(Signed) J. CHAMBERLAIN.

DIII.—NEW ORCHIDS.—DECADE 16.

151. **Restrepia sanguinea**, *Rolfe*; caule secundario brevi, vaginis lanceolatis acutis conduplicatis carinatis immaculatis, foliis ellipticis subobtusis apice minutissime tridenticulatis, pedunculis gracilibus, bracteis basi tubulosis apice triangulari-ovatis acutis, sepalo postico basi lanceolato abrupte valde attenuato apice subclavato lateralibus ad medium v. ultra connatis lobis apice subacutis, petalis basi lineari-lanceolatis abrupte valde attenuatis apice subclavatis, labello subpandurato-oblongo truncato verruculoso lobis lateralibus falcato-setaceis, columna clavata incurva.

HAB.—Colombia.

Folia 1¾ poll. longa, 8 lin. lata. *Vaginæ* 10 lin. longæ. *Pedunculi* 1½–1¾ poll. longi. *Bracteæ* 3 lin. longæ. *Sepala* 9 lin. longa. *Petala* 7½ lin. longa. *Labellum* 5 lin. longum, 1½ lin. latum. *Columna* 3 lin. longa.

Introduced by Messrs. Charlesworth & Co., of Bradford, with whom it flowered in November last. It much resembles *R. pandurata*, Rchb. f., in general character, but apart from structure it differs from that and every other species in having wholly crimson flowers, with the exception of a small yellow blotch at the base of the column and the extreme base of the lateral sepals.

152. **Dendrobium quadrilobum**, *Rolfe*; sarmentosa, caulibus ramosis, pseudobulbis fusiformi-oblongis brevibus monophyllis, foliis oblongis v. elliptico-oblongis obtusis sessilibus, floribus terminalibus solitariis, bracteis ovatis acutis concavis, sepalo postico ovato-oblongo subobtuso lateralibus apice triangulo-ovatis obtusis basi cum pede columnæ in mentum longum extensis, petalis ovato-oblongis obtusis, labello trilobo lobis lateralibus erectis angustis apice rotundatis denticulatis intermedio profunde obcordato-bilobo laciniis rotundatis, disco bicarinato, columna brevissima.

HAB.—Uncertain, but probably New Guinea or one of the adjacent islands.

Caules 6–9 poll. longi. *Pseudobulbi* ½–1 poll. longi. *Folia* 1–1½ poll. longa, 5–7 lin. lata. *Bracteæ* 1 lin. longæ. *Pedicelli* 6 lin. longi. *Sepalum* posticum 4 lin. longum, 2 lin. latum; lateralia 1 poll. longa, 4 lin. lata. *Petala* 4 lin. longa, 1½ lin. lata. *Labellum* 11 lin. longum, 6 lin. latum. *Columna* 1 lin. longa. *Mentum* 9 lin. longum.

A very distinct species of the section *Cadetia*, received in 1895 along with other Dendrobes, from F. A. Newdigate, Esq., M.P., Nuneaton, who obtained them from Australia. It flowered at Kew in

October last. The leaves are unusually small, and the flowers large for the section, and uniformly pale whitish green.

153. **Bulbophyllum longiscapum**, *Rolfe* ; rhizomate repente valido, pseudobulbis ovoideis monophyllis, foliis lineari-oblongis subacutis coriaceis breviter petiolatis, scapis elongatis gracilibus apice floriferis, bracteis distichis imbricatis conduplicatis carinatis triangularibus acutis, floribus paucis singillatim evolutis mediocribus, sepalo postico triangulari-lanceolato acuminato lateralibus similibus basi latis, petalis parvis late ovato-oblongis denticulatis apice setiferis, labello elongato basi lato bicarinato apice gradatim attenuato acuto carnoso latere undulato lobis lateralibus erectis oblongis subobtusis brevibus carnosis, columna oblonga dentibus setiformibus.

HAB.—Fiji.

Pseudobulbi ¾–1 poll. longi. *Folia* 4–5 poll. longa, 9–14 lin. lata. *Scapi* 1½ ped. longi. *Bracteæ* 4–5 lin. longæ. *Pedicelli* 4 lin. longi. *Sepala* 10 lin. longa. *Petala* 1 lin. longa. *Labellum* 8 lin. longum. *Columna* 3 lin. longa.

Sent to Kew by Mr. Yeoward, Curator, Botanical Station, Fiji, in 1891, with *Hydnophytum longiflorum*, A. Gray. It flowered in November last, and is remarkable in having a long scape and short raceme, and a long attenuated lip. The flowers are light green, except the foot of the column and the lip, which are red-purple, the latter passing to deep yellow at the tip. The mid-nerve of the petals is also purple.

154. **Bulbophyllum macrochilum**, *Rolfe* ; pseudobulbis ovatis parvis monophyllis, foliis lineari-oblongis subacutis basi subattenuatis, scapis elongatis gracilibus apice floriferis, bracteis ovato-oblongis acutis carinatis, floribus paucis singillatim evolutis mediocribus, sepalis lineari-lanceolatis acuminatis, petalis late ovatis subacutis crenulatis, labello elongato lineari-lanceolato acuminato latere undulato lobis lateralibus erectis falcato-linearibus, columna oblonga dentibus brevibus.

HAB.—Borneo, *G. D. Haviland*.

Pseudobulbi 4–5 lin. longi. *Folia* 5½ poll. longa, 11 lin. lata. *Scapi* 10 poll. longi. *Bracteæ* 3–4 lin. longæ. *Pedicelli* 4 lin. longi. *Sepala* 10–11 lin. longa. *Petala* 1 lin. longa. *Labellum* 9 lin. longum. *Columna* 2 lin. longa.

Closely allied to the preceding, but readily distinguished by the absence of a bristle at the apex of the petals, the short teeth of the column, and the different colour. Dr. Haviland records the latter as—"Perianth with pink longitudinal veins; lip pink; column yellow."

155. **Bulbophyllum attenuatum**, *Rolfe* ; scapis elongatis gracilibus apice floriferis, bracteis distichis conduplicatis carinatis triangulari-ovatis, floribus paucis singillatim evolutis mediocribus, sepalo postico lineari-lanceolato apice caudato-attenuato lateralibus basi triangularibus apice caudato-attenuatis, petalis lanceolato-ovatis acutis v. apiculatis integris, labello basi elliptico integro apice caudato-attenuato lineo medio carnosiusculo, columna brevi dentibus brevibus.

HAB.—Borneo.

Scapi 9 poll. longi. *Bracteæ* 4 lin. longæ. *Pedicelli* 6 lin. longi. *Sepala* 1–1¼ poll. longa. *Petala* 1 lin. longa. *Labellum* 10 lin. longum. *Columna* 1 lin. longa.

Habit of the preceding species, but differing in having caudate sepals and lip; the latter without side-lobes. Introduced by Messrs. Linden, with whom it flowered in October, 1892. The sepals are veined with maroon-purple on a lighter ground, and the rest of the flower strongly suffused with the same colour.

156. **Lanium subulatum**, *Rolfe;* pseudobulbis ovoideo-oblongis v. oblongis diphyllis, foliis lineari-subulatis subacutis carnosis subteretibus canaliculatis arcuatis, paniculis pauci-ramosis brevibus pubescentibus, bracteis lanceolatis acutis, sepalis late lanceolatis subacutis subconcavis extus pubescentibus, petalis linearibus subacutis, labello elliptico-ovato breviter acuminato concavo nervo medio crassiusculo, columna clavata.

Hab.—Brazil, prov. Minas Geraes.

Pseudobulbi 6–9 lin. longi. *Folia* $1\frac{1}{4}$–$1\frac{3}{4}$ poll. longa, 1–$1\frac{1}{4}$ lin. lata. *Paniculæ* $1\frac{1}{2}$ poll. longæ. *Bracteæ* $\frac{3}{4}$ lin. longæ. *Pedicelli* $1\frac{1}{2}$ lin. longi. *Sepala* et *petala* $1\frac{1}{2}$ lin. longa. *Labellum* 1 lin. longum. *Columna* $\frac{1}{3}$ lin. longa.

A curious little plant, introduced by Messrs. F. Sander & Co. It is the fourth known species of the genus, and differs from the rest in its subulate leaves and much smaller flowers. The colour of the latter is pale green, with a little suffusion of pink in the sepals.

157. **Epidendrum atrorubens**, *Rolfe;* foliis lineari-oblongis obtusis, scapis paniculatis laxifloris, bracteis ovatis obtusis parvis, sepalis subspathulatis subobtusis, petalis spathulatis subobtusis, labello libero trilobo lobis lateralibus oblongis obtusis intermedio suborbiculari apiculato undulato medio carinato venis elevatis, disco carnoso, columna clavata.

Hab.—Mexico.

Folia circa 8 poll. longa, $1\frac{1}{4}$ poll. lata. *Bracteæ* 1 lin. longæ. *Pedicelli* 9–10 lin. longi. *Sepala* 9 lin. longa. *Petala* 8 lin. longa. *Labellum* 6 lin. longum. *Columna* $3\frac{1}{2}$ lin. longa.

This belongs to the section *Encyclium*, and is allied to *E. selligerum*, Batem. and *E. plicatum*, Lindl., but has smaller flowers of much deeper colour. It flowered first with Messrs. Linden, in October 1892. The sepals and petals are very dark red-purple, and the lip a rather lighter shade, in which respect it approaches *E. Hanburyi*, Lindl.

158. **Spiranthes metallica**, *Rolfe;* foliis rosulatis subsessilibus elliptico-oblongis subacutis metallicis interdum pallido-maculatis, scapis elatis robustis pubescentibus vaginis subdistantibus tectis, bracteis lanceolatis acuminatis concavis pubescentibus, ovariis pubescentibus, sepalis herbaceis pubescentibus lateralibus oblique oblongo-lanceolatis acuminatis basi ovarii marginibus longe decurrentibus tubum longum formantibus liberis postico oblongo-lanceolato cum petalis in galeam connivente apice libero recurvo acuto, petalis lanceolato-oblongis petaloideis apice liberis acutis, labello longe unguiculato apice ovato subacuto recurvo ungue infra medium sagittato, columna brevi.

Hab.—Brazil, *Gardner*, n. 672, and British Guiana, Mimatta. *Jenman*, n. 5914.

Folia 4–6 poll. longa, $1\frac{1}{2}$–3 poll. lata. *Scapi* 1–2 ped. alti. *Bracteæ* $\frac{3}{4}$–$1\frac{1}{4}$ poll. longæ. *Ovaria* $1\frac{1}{4}$–$1\frac{1}{2}$ poll. longa. *Sepala* et *petala* 5 lin. longa. *Labelli* unguis 1–$1\frac{1}{4}$ poll. longus, limbus 3–4 lin. longus. *Columna* 3 lin. longa.

Closely allied to *S. picta*, Lindl., but the perianth-segments are only about half the size, and the leaves are of a peculiar olive-brown or metallic shade, frequently bearing a number of paler spots. It first flowered with Messrs. Veitch in 1882. The flowers are light green with a whitish lip.

159. **Macodes sanderiana**, *Rolfe*; foliis ovato-oblongis v. elliptico-oblongis subacutis in petiolum attenuatis insigniter variegatis, scapo elato pubescente multifloro, bracteis ovatis acutis concavis membranaceis, sepalis ovato-oblongis obtusis concavis, petalis lineari-oblongis obtusis, labello basi ventricoso apice spathulato obtuso, sacco basi biglandulo so apice utrinque auriculato, columna brevi.—*Anœctochilus sanderianus*, Kränzl. in Gard. Chron., 1895, xviii., p. 484.

HAB.—Sunda Islands, *Forget*.

Folia 2½–4 poll. longa, 1½–2 poll. lata. *Scapus* 1 ped. altus; racemus 3 poll. longus. *Bracteæ* 3 lin. longæ. *Pedicelli* 4–5 lin. longi. *Sepala* et *petala* 2½–3 lin. longa. *Labellum* 2½ lin. longum. *Columna* 2 lin. longa.

Introduced by Messrs. F. Sander & Co., with whom it flowered in December last. It is allied to *M. argyroneura*, Rolfe (*Hæmaria argyroneura*, Miq.), but, among other characters, the venation of the leaf is very different. The leaves are dark olive-green reticulated with greenish-yellow veins, and the flowers pale green lightly suffused with brown.

160. **Holothrix Johnstoni**, *Rolfe*; scapo piloso, bracteis ovatis acutis concavis pilosis, sepalis oblongis obtusis concavis conniventibus apice pilosis, petalis linearibus obtusis sepalis duplo longioribus, labello basi oblongo apice flabellato-quinquifido lobis oblongis obtusis, calcare brevi conico obtuso, columna brevissima.

HAB.—British Central Africa: upper Plateau of Mlanje, near Zomba, *Sir H. H. Johnston*.

Scapi 5 poll. alti.; racemi 1–1½ poll. longi. *Bracteæ* 2–2½ lin. longæ. *Pedicelli* 2 lin. longi. *Sepala* 2½ lin. longa. *Petala* 5 lin. longa. *Labellum* 4½ lin. longum. *Calcar* ½ lin. longum. *Columna* ½ lin. longa.

This resembles the South African *H. condensata*, Sond., but differs in its much larger flowers, and five-lobed lip. The leaves are unknown.

DIV.—TWO AFRICAN HOLARRHENAS.

(*Holarrhena africana*, A. DC., and *H. febrifuga*, Klotz.)

In the *Kew Bulletin*, 1895, p. 245, mention is made of *Holarrhena africana*, called at Lagos "the male rubber tree." Specimens of this plant had been received at Kew on two occasions as the true rubber tree of Lagos. The latter, as stated in the *Bulletin*, has been determined to be *Kickxia africana*, Benth.

The chief economic interest attached to *Holarrhena africana* is on account of its medicinal properties. According to Wulfsberg,* the bark

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* *Holarrhena africana*, A.DC. Inaugural dissertation of N. Wulfsberg (of Christiana). Gottingen, 1880.

is known at the Gold Coast as "Gbomi" or "Kpomi." Harnberger is quoted as having paid the sum of twenty pounds for a native cure for dysentery. This proved to be the bark of *Holarrhena africana* steeped in palm wine. The bark is also said to yield an alkaloid similar to *conessine*, the active principle in the bark of the Indian *H. antidysenterica*. A similar use of the bark of *H. africana* is referred to by Planchon and E. Collin in *Les Drogues Simples*, p. 704.

Mr. G. F. Scott Elliot on specimens of *Holarrhena africana* collected by him at Sierra Leone, simply adds: "The people at Layah use the feathers for pillows." In Oliver's *Flor. Trop. Africa*, iii., 44, it is stated that "*Rondeletia floribunda*, G. Don (Gard. Dict. iii., pp. 5 and 6, No. 17) is *Holarrhena africana*, DC," which belongs to the Apocynaceæ. In the *Bulletin*, p. 245, it was inadvertently referred to the Rubiaceæ. It is apparently confined to West Africa, and all the specimens at Kew are from that region. It ranges from Sierra Leone to the lower Niger, and was sent from Lagos by Captain (now Sir Alfred) Moloney in 1883. We are still without authentic information as to its value, if any, as a rubber plant.

A common plant in East Africa, especially in the Zambesi region, called "Quina" by the Portuguese, and figured in Livingstone's "Missionary Travels," 1857, p. 648, under the native name of "Kumbanzo," is *Holarrhena febrifuga*. This was collected at Tette by Sir John Kirk in 1859; in the Manganja Hills by Mr. C. J. Meller in 1861, and it extends westward beyond Lake Nyanza, and northward to Usambara. Speke and Grant call it "Jasmine" on account of the sweet odour of the flowers. Later specimens in the Kew Herbarium are from Usugara in what is now German East Africa.

Livingstone refers to the use of the bark in cases of fever. The "name and properties of this bark," he says, "made me imagine that it was a cinchonaceous tree." His further account is as follows: "The thick soft bark of the root is the part used by the natives, the Portuguese use that of the tree itself. I immediately began to use a decoction of the bark of the root, and my men found it so efficacious that they collected small quantities of it for themselves and kept it in little bags for future use. Some of them said that they knew it in their own country, but I never happened to observe it. The decoction is given after the first paroxysm of the complaint is over. The Portuguese believe it to have the same effects as quinine, and it may prove a substitute for that invaluable medicine."

This estimation of the value of *Holarrhena febrifuga* in East Africa, as of *H. africana* in West Africa, recalls the use of the allied *H. antidysenterica* in India. The bark of the stem and root and the seeds of the latter "are amongst the most important medicines of the Hindu Materia Medica." (Watt's *Dict. Econ. Prod. India*, iv., 255).

Mr. C. J. Meller, already quoted, collected numerous specimens of *Holarrhena febrifuga*. He, however, says nothing about the medicinal properties of the plant. Attached to specimens collected in the Manganja Hills in 1861 he gives the following information: "'Maconga' or 'Macombi.' Flowers white. Trailing and climbing to a great height, with rough corrugated bark; yields a plentiful thin juice affording the india-rubber of the natives; tree very abundant, Mino." Another specimen of the same plant, also collected by Meller in the Manganja Hills, at an elevation of 1 to 3000 ft., is marked "'Kacopi.' A native rubber is obtained from this and also several others, two of

which are represented in the Mino parcel." The plant is described as "a tree 10–25 feet high, yields a milky juice; flowers white."

It may be added that Dr. Stapf regards *Holarrhena glabra*, Kl., and *H. tettensis*, Kl., both from East Africa, as forms of *H. febrifuga.*

DV.—NATURAL SUGAR IN TOBACCO.

The following papers record the solution of an interesting problem which was submitted to Kew some years ago by the Treasury. Its primary importance was purely fiscal, but its investigation led to the discovery of some striking facts which do not appear to have been published since.

The "standard authorities" at the time were not prepared to admit "the presence in tobacco of more than a trace of saccharine matter." On the other hand experiments made at Somerset House "with tobacco grown at Kew" showed "a considerable amount of sugar to be present" naturally.

Professor Church was so good as to examine the literature, and it appeared, at least as far as fermented tobacco was concerned, to practically confirm the standard authorities.

It became clear that the question could only be solved by further investigation, and Dr. Hugo Müller, F.R.S., who is an acknowledged authority on the chemistry of the carbo-hydrates, was so good as to undertake it.

The results, as far as the fiscal question was concerned, were absolutely conclusive. From a scientific point of view they were not less valuable. A commercial sample of "Bright Virginia" tobacco was found to contain as much as 15·2 per cent. of saccharine matter. The sun-dried leaves of *Nicotiana Tabacum* grown at Kew contained 6·2 per cent., and those of a form of the same species grown at Ewell Railway Station as much as 9 per cent., "the largest quantity found in the leaves of plants grown in this country."

As to the nature of this sugar, Dr. Hugo Müller was led "to the conclusion that neither lævulose nor glucose was present, and that the saccharine matter of tobacco is composed of at least three different sugar-like substances which, so far as my present knowledge goes, I must consider as new to chemistry."

Treasury to Royal Gardens, Kew.

Treasury, S.W., August 7th, 1883.

Dear Sir Joseph Hooker,

A somewhat difficult question of botanical chemistry has arisen, in practical form, in connexion with the tobacco duties, upon which Mr. Courtney would be very glad of your advice.

Under the present law and practice, the duty on all tobacco (other than cigars) is 4*s.* 4*d.*, except in the case of "sweetened" tobacco, which is charged 4*s.* 10*d.*; but cigarettes made of the "sweetened" article are not allowed to be imported at all, for reasons with which you need not be troubled. It is in connexion with this prohibition of the importation of "sweetened" cigarettes that the present difficulty has arisen.

Mo. Bot. Garden,

Previous law and practice have always assumed that there is no appreciable amount of native sugar in tobacco, and consequently when any was found on analysis it has been assumed to be added. Certain importers have recently asserted that in some sweetened cigarettes of theirs, detained by the Customs, the saccharine matter is not added but native, and have brought forward a report by Professor Attfield, Chemist to the Pharmaceutical Society, in favour of the possibility of this being true. Dr. Bell, the Government Analyst at Somerset House, also reported that the sugar in this case "was natural to the tobacco and had not been added thereto." Moreover, Dr. Bell had made experiments with tobacco grown at Kew (in which there could be no suspicion that anything had been artificially added), and found a considerable amount of sugar to be present.

On the other hand, we are informed that the standard authorities do not admit the presence in tobacco of more than a trace of saccharine matter (Dr. Stevenson's name is mentioned on this side); so that although there seems to be a preponderance of authority in favour of its being (at least occasionally) so present, the question is not free from doubt.

Assuming, however, that the possibility of its presence be admitted, the question arises whether sugar naturally present can practically be distinguished by analysis from that which is added. This is of importance because of the question of allowing cigarettes to be imported; moreover, the higher rate on "sweetened" (manufactured) tobacco is imposed as an equivalent to the restrictions placed on the home manufacturer, and it would not be logically defensible to make the same extra charge if the article were proved to be in its natural condition. Here, again, we have a conflict of opinion, Dr. Bell saying that the added and the natural sugar could be distinguished, while the gentleman who advises the Board of Customs on such questions says they could not be so, *in a tobacco infusion.*

If you could give any advice or suggestion to help the Government in deciding upon these two points, it would be extremely acceptable.

Yours very truly,
(Signed) S. E. Spring-Rice.

Professor Church, F.R.S., to Royal Gardens, Kew.

Sugar in Tobacco.

The presence of a sugar in fresh tobacco seems to have been first ascertained by J. Nessler; *see* his *Der Tabak, seine Bestandtheile und seine Behandlung;* Mannheim, 1867. The amount is very small and it wholly disappears during the fermentation to which the leaf is subjected in the process of curing. In Grandeau's *Traité d'Analyse des Matières Agricoles* (Paris, 1877), page 278, it is stated that the sugar occurs chiefly "*dans la moelle de la tige.*" Dr. J. Koenig's *Nahrungs- und Genuss-Mittel* (Berlin, 1879–80) contains a good deal of analytical information about tobacco (*see* pp. 493 to 502 of Volume II., also pp. 194–8 of Volume I.) The abstract of papers in the *Jahresbericht der Agricultur-Chemie* (24 vols.) contain no further information.

(Signed) A. H. Church.

Shelsley, Kew, August 10, 1883.

Dr. Hugo Müller, F.R.S., to Treasury.

13, Park Square East, N.W.,
17th December 1883.

Sir,

In compliance with the request contained in your letter of the 17th August, I have carried out a series of experiments with the view to answering your questions:—

(1.) As to whether natural saccharine matter is contained in the so-called sun-dried or yellow tobaccos;

(2.) Whether such sugar can be distinguished with sufficient certainty for Revenue purposes from that which may be added.

I may state that my answers are both in the affirmative.

I regret the unavoidable delay in rendering this report, but I felt that unless I could devote sufficient time to the carrying out of the experimental work necessary, my opinion could have but little weight.

I have, &c.,
(Signed) Hugo Müller.

Leonard H. Courtney, Esq., M.P.,
Treasury Chambers, S.W.

Report on the occurrence of Saccharine Matter in certain kinds of Commercial Tobaccos.

In collecting the materials for this investigation I took pains to secure, as much as possible, good representative specimens of the particular kinds of tobacco in question, and for this purpose I selected myself at wholesale houses the various samples I required from the hogsheads or original packages in which the raw tobacco is imported.

As it appeared to me of special importance to obtain also further evidence as to the presence of sugar or a saccharine matter in the growing tobacco plants, I applied to the authorities of Kew, and I have great pleasure in acknowledging here the readiness with which my request for a supply of leaves was complied with in that quarter. I must, however, not omit to mention that at the time when I was requested to undertake the present investigation, the season was already too far advanced for me to secure a sufficient quantity of fresh material for an exhaustive examination of this subject.

The samples of commercial tobaccos were all of pale colour and most of them were of the kind which in the trade is known as "sun-dried" tobacco.

The following is a list of the sorts I examined:—Algerian, Kentucky, Greek, Turkish, Syrian, Chinese, Virginia leaf, Bright Virginia.

The chemical tests usually employed for the detection of sugar, or saccharine substances, established the fact that nearly all of them contained more or less, and after some preliminary trials I adopted the reduction or Fehling's process for the quantitative determinations. I give in the following list the percentages of saccharine matter thus obtained:—

Algerian	none.
Kentucky	none.
Greek	a trace.
Turkish	2·3 per cent.
Syrian	2·8 „
Chinese	3·5 „

Virginia leaf	5·4	per cent.
" another sample	7·2	"
" another sample	9·8	"
Bright Virginia	10·6	"
" another sample	12·5	"
" another sample	15·2	"

It will thus be seen that whilst the oriental tobaccos contain only a small quantity, the percentage in some of the Virginian is surprisingly high. The presence of so large an amount of saccharine matter was so unexpected that I thought it desirable to repeat the experiment in this case with three different lots from the same tobacco; but this only served to confirm the former results, the numbers obtained varying only with one half per cent.

To all appearance the quality of the kind of tobaccos under examination coincides with the percentage of saccharine matter, for those which had been pointed out as the better sorts contained the larger quantity.

It seems that the best class of the bright yellow Virginian is characterised by a uniform bright yellowish colour, and by its well developed, unusually large leaves, which are more or less entire, and exhibit a certain toughness and gumminess much appreciated by the manufacturers. It becomes therefore quite possible, after a little practice, to select with comparative ease the kinds of tobaccos which contain a high percentage of saccharine matter.

The oriental tobaccos which I examined were not of a high class, and as I was unable to obtain samples of the better kinds, I am not in a position to state whether these tobaccos ever contain as much saccharine matter as the Virginian.

The Algerian and Kentucky leaf, which were found to be free from saccharine matter, cannot be strictly classed with so-called sun-dried tobaccos, for although of a light colour they were of a distinctly different tint, verging on brown, and this may be considered as an indication that they were not prepared or cured by the same process as the bright Virginian.

The leaves of growing tobacco plants which I received from Kew were collected at the end of August and the beginning of September, and as I was then absent from town they were carefully dried in the sun. The samples were but small, consisting of a few leaves of each sort. Their colour was a faded green and not like that of tobacco.

There were in all ten sorts or varieties of the two principal species *Nicotiana Tabacum* and *Nicotiana rustica*, the former being the one chiefly cultivated in America, whilst the latter seems to furnish most of the oriental tobaccos.

It may be sufficient for the present purpose to state that in all these specimens the presence of saccharine matter was indicated, but very different amounts, as will be seen from the following list:—

Nicotiana texana, var. *rustica*	1·5	per cent.
Shiraz tobacco	4·6	"
N. rustica	4·0	"
N. Tabacum, var. *virginiana*	2·3	"
Maryland tobacco	5·0	"
Nicotiana Tabacum	6·2	"
Bhilsa tobacco	3·5	"
N. Tabacum, var. *attenuata*	3·2	"
N. gigantea	4·2	"
N. macrophylla purpurea	4·5	"

I had also an opportunity of examining green leaves of *N. Tabacum* var. immediately after being taken from plants at the Zoological Gardens, and at Ewell railway station Of the former, one sample was taken from plants which had rot flowered, and it contained nearly 2 per cent., whilst in a second sample from a plant which had flowered a mere trace was detected. The sample from Ewell, however, which was collected in the middle of October, contained a little over 9 per cent., the largest quantity found in the leaves of plants grown in this country, and it is a noteworthy fact that these leaves contained also more starch than any of the other specimens.

It is to be understood that all these percentages are referred to air-dry leaves containing from 12 to 13 per cent. of moisture, whilst the commercial tobaccos mentioned above contained from 13 to 15 per cent. It will thus be seen that the percentage of saccharine matter varied very largely in these specimens, and from considerations which it would lead me too far to detail here, I am inclined to believe that even in the same plant the percentage will vary in accordance with the development, with the activity of growth, and also with the conditions of climate.

Although these experiments with fresh leaves are of some value in acording additional proof that saccharine matter is a never-failing constituent of the tobacco plant, they are in no way conclusive as to the quantity which may under more favourable circumstances be produced by this plant. It is more than probable that the varieties which, even when grown in this country, produced as much as 9 per cent., may, when cultivated in Virginia, yield a very much larger quantity, and even so large an amount as the 15 per cent. found in "Bright Virginia" seems now no longer surprising.

I am informed that it is only of late years that tobaccos with a notable percentage of saccharine matter have made their appearance in commerce, when, in consequence of the fashion of cigarette smoking becoming more general, the great demand for the yellow sun-dried tobaccos induced the Virginian growers to produce a tobacco imitating the Turkish type, and should it hereafter be proved that some kinds of yellow tobaccos from certain localities invariably contain considerably more of it than others, we may safely conclude that this development of saccharine matter is a mere accidental effect of the improvement of the cultivation.

From a pamphlet on tobacco published at Richmond, Virginia, by Robert L. Ragland, we learn how much care and attention are required in the cultivation and curing of the yellow tobacco. The author gives full particulars as to the conditions and temperatures under which first the yellowing process and then the fixing of the colour, *i.e.* drying of the leaves, is carried out. Without entering into the technical details of this manufacture, it will be sufficient to state that the conditions observed are precisely those which would preclude as much as practicable every possibility of fermentation or the destruction of saccharine matter contained in the green leaves.

For the present, we are ignorant of the chemical changes involved in the yellowing process, but it seems not unlikely that it resembles the ripening process of fruits, and we may therefore surmise that an additional quantity of saccharine matter is thereby produced. This hypothesis receives some support from the observed fact that the vigorously growing leaves of certain plants will show a little while after being cut off, an increase in the amount of sugar produced by them.

Although I have in the foregoing shown that a very considerable quantity of saccharine matter may be present in certain kinds of tobacco

as a natural constituent, I had no means of proving that so large an amount as 15 per cent. (the quantity I found in the best bright Virginia leaf) was produced by the plant itself. I may, however, mention some facts which I think very clearly show that it is by no means an easy matter to effect an addition of sugar to tobacco without its presence being betrayed.

According to direct experiments made with some of the yellow tobaccos under examination and with one of the specimens of leaves from Kew, it seems that the amount of matter they contain which is soluble in cold water, varies only within a few per cents.

Bright Virginia	56·1 soluble in water. 43·6 insoluble in water.
Virginia leaf	57·7 soluble in water. 42·0 insoluble in water.
Nicotiana Tabacum, var. *attenuata*, from Kew.	58·0 soluble in water. 42·5 insoluble in water.

It will be readily seen from this that the addition of even a few per cents. of sugar to tobaccos of this class would upset the average proportion of soluble and insoluble matter, unless a proportionate amount of soluble matter had been previously removed.

I made also an experiment to introduce sugar into one of the inferior kinds of Virginia leaf by means of steeping the leaves into a sugar solution of moderate strength, and drying them carefully afterwards. I found that by this process not only was the colour very considerably deteriorated, but the sugar seemed to have penetrated but little, for its presence on the surface was readily perceptible by the stickiness and sweet taste.

Having now given my answer to the first question, by having shown that saccharine matter forms a natural constituent of the tobacco plant, and that there is every reason to believe that the saccharine matter found in the particular kinds of commercial tobaccos under consideration is also natural and not added, I will now enter upon the discussion of the second question, as to whether such natural sugar can be distinguished with sufficient certainty for revenue purposes from that which may be added.

The many substances which are comprised in the general term "saccharine matter" or sugar, are characterised by certain chemical and physical properties which they have in common, and by which as a class they can be recognised. We are also acquainted with certain specific reactions by which the principal members of this class of bodies, viz., cane sugar (saccharose), fruit sugar (invert sugar), and starch sugar (glucose or dextrose) can be detected when mixed with other soluble substances, without actually separating or isolating them. In conjunction with these chemical reactions, it is the optical test, *i.e.* the specific action of the different sugars on polarised light, which affords the means we depend on when we search for them or wish to determine their quantity.

It is thus that the well-known "Fehling's copper test" and the "fermentation test" have both revealed the presence of a substance or substances contained in certain tobaccos, which must be considered to belong to this class of chemical substances. On the other hand, however, the polariscope failed to indicate the presence of saccharine matter. Only a very faint left-handed rotation could be noticed which was out of all proportion to the amount of saccharine matter indicated by the two chemical tests.

I noticed this inactivity on the polarized light, not only when testing the commercial tobaccos, but also in a few cases when the material from fresh leaves was sufficient for the experient.

This want of optical activity is very remarkable, and as the saccharine matter of tobacco differs in this respect from the ordinary sugars we must conclude that we have to do here with a new kind of sugar peculiar to tobacco. However, before this could be accepted as a fact, we had to dispose of the possibility that this inactivity might be caused by the interference of the large amount of other matter with which it is associated.

Besides this, it was just possible that this saccharine matter was in reality fruit sugar, or invert-sugar, in which the two compounds, the left handed rotating lævulose, and the right-hand rotating glucose, are present in such a proportion that the rotation is compensated and becomes nil. For the present purpose, it was of special importance that this uncertainity should be removed, the more so as I have it on good authority that inactive invert-sugar has every now and then been noticed in commerce, and, therefore, the polariscope might not under all circumstances prove to be so reliable a means for detecting in manufactured tobacco any surreptitious addition of sugar.

Conclusive evidence could only be obtained by a chemical study of the tobacco sugar in its pure state, and for this purpose I have prepared, with the expenditure of much time and labour, a sufficient quantity of this substance in as pure a condition as the known methods for isolating these kinds of bodies will admit.

The saccharine matter thus extracted from Bright Virginia leaf forms an amorphous gum-like pale yellow substance, readily soluble in the strongest alcohol, and also in water, with which it forms a thick treacle, possessing but a very faint sweet taste, which is another marked difference from the ordinary sugars.

On submitting now this substance to a further treatment which, under the supposition that it was composed of lævulose and glucose, would have effected their separation, I obtained a small quantity of a body which, like lævulose, formed with caustic lime a solid compound, but turned the ray of polarized light to the right, whilst the larger bulk formed a liquid compound with lime, and exhibited a very small rotation to the left.

These results lead me to the conclusion that neither lævulose nor glucose was present, and that the saccharine matter of tobacco is composed of at least three different sugar-like substances which, so far as my present knowledge goes, I must consider as new to chemistry.

As the practical result of this investigation, I must, therefore, express it as my opinion that the presence of natural sugar in tobacco does not preclude the possibility of detecting by ready means any ordinary sugar which might be added to manufactured tobacco.

December 17th, 1883.

DVI.—MISCELLANEOUS NOTES.

Botanical Magazine for January.—All the subjects figured are from drawings prepared from plants grown at Kew. *Talauma Hodgsoni*, long known from the fine representation of it in Hooker's *Illustrations of Himalayan Plants*, flowered in the Temperate House, after being

20 years in the establishment. Unfortunately the gorgeous flowers fall almost as soon as they expand. The showy *Acidanthera æquinoctialis* (Irideæ), was raised from corms sent from Sierra Leone, in 1893, by Captain Donovan. *Lonicera Alberti* is one of Dr. Albert Regel's numerous discoveries in Turkestan, and was raised at Kew from a young plant presented by his late father Dr. de Regel, Director of the Imperial Gardens at St. Petersburg. It is one of the prettiest species of the section *Xylosteum*, having lilac-purple flowers; but it appears to require a continental climate to attain full development. *Acacia spadicigera* is one of those species having enormous spine-like, hollow stipules, commonly tenanted by fierce ants, which serve to protect it from a variety of foes in its native country, Mexico and Central America. The Kew plant was obtained from M. Linden of Ghent, in 1882. *Cyrtopodium virescens* is a Brazilian species, imported by Messrs. Sander, from whom the Kew plant was procured in 1893.

Hooker's Icones Plantarum.—The second part of the current volume, plates 2426 to 2450, contains figures of several plants of unusual interest. Foremost among these is the Juan Fernandez sandalwood, *Santalum fernandezianum*, of which some particulars are given in the *Kew Bulletin*, 1894, p. 110. *Woodrowia* and *Halopyrum* are new genera of grasses from India. Several of the novelties discovered by Mr. Lunt (the Kew collector who accompanied Mr. Bent's expedition to Hadramaut), and previously described in the *Bulletin*, are figured, including the new genus *Bentia* (Acanthaceæ), *Blepharispermum hirtum* (Compositæ), the singular *Ipomœa crinigera* and the outlying malpighiaceous *Acridocarpus orientalis*. *Phillipsia fruticulosa* is a new genus of Acanthaceæ from the neighbouring Somaliland. *Cyclocheilon somaliense* (*Kew Bulletin*, 1895, p. 222) is an anomalous genus from the same country referred to the Scrophularineæ, though further investigation leads to the conclusion that it would be better placed in the Acanthaceæ.

Hand-list of Orchids.—This hand-list was issued in January. The following account is given in the Preface of the history and extent of the orchid collections at Kew :—

" The collection of Orchids cultivated at Kew is essentially different from any, at least in this country, in the possession of a private collector, and perhaps its only rival is that of the Royal Botanic Gardens, Glasnevin. Its main object is botanical and to represent the family *Orchideæ* in as comprehensive a way as possible. The scientific interest attaching to orchids is very great. But even as regards form they can only be studied from dried specimens with great difficulty, and as regards their varied and remarkable structural arrangements and the striking mechanical contrivances for cross-fertilisation which they exhibit, they cannot be studied in the dried state at all. While the Kew collection contains representatives of all the most beautiful and popular species, it is more especially rich in others which at first sight are not particularly attractive. Most of these, however, on careful examination will be found to possess no small degree of charm and interest.

"In 1880, Dr. Pfitzer, Professor of Botany in the University of Heidelberg, came to Kew to study in the Jodrell Laboratory the Kew collection of orchids for his well-known researches on their morphology, and he has continued to draw on it since for further aid.

"Dried herbarium specimens of orchids are not easily procurable. Species frequently flower at Kew of which no other material exists available for study. By this means the Herbarium of the Royal Gardens has been continuously enriched. And in this respect it is also under great obligations to Glasnevin, the Right Honourable Joseph Chamberlain, Sir Trevor Lawrence, and others.

"The task of exhibiting a collection of orchids to the public is not an easy one. The dimensions of the houses which are suitable to their cultivation and the conditions which it requires are such as to preclude the admission of visitors. This is, however, of the less consequence, as when out of flower their general aspect for the most part is not, except perhaps to the expert, either instructive or interesting. The two public orchid houses at Kew, Nos. 13 (warm) and 14 (cool), contain for the most part only the plants which happen to be in flower at any particular period. These houses are not suited to the permanent cultivation of the bulk of the collections which at other times is carried on in the orchid pits (No. 15), to which the public is not admitted.

"The cultivation of orchids is one of the most remarkable developments of modern horticulture. Kew has neither the means nor the accommodation to compete with the magnificent displays of certain species to be seen in the gardens of many private growers. The President of the Royal Horticultural Society in 1885 complained, in his opening address to the Orchid Conference held in that year, that 'there is no sufficiently representative collection of orchids there (at Kew) at present.' It is hoped that the present Hand-list, which enumerates 200 genera and 1800 species (including about 50 garden hybrids), will remove that reproach as far, at any rate, as its representative character is concerned. And it is only right to say that in arriving at this result Kew is under great obligations to the liberality of Sir Trevor Lawrence, the Keeper of the Royal Botanic Gardens, Glasnevin, and various private growers and commercial firms, especially amongst the latter Messrs. F. Sander & Co., of St. Albans. The bulk of the collection has, however, been built up by direct importation and purchase.

Orchids have been continuously cultivated at Kew from their earliest introduction into this country. The varied fortunes which have attended the collection practically reflect the history of the progress which has been made in the art of growing orchids under artificial conditions.

The first exotic orchid which was introduced into English gardens was *Bletia verecunda*, which was obtained from Providence Island, Bahamas, by Peter Collinson, in 1731, and flowered in the following year in the garden of Mr. Wager. About the year 1778 *Phaius grandifolius* was imported from China by Dr. Fothergill, and a full-sized coloured figure of it is given in the first edition of the *Hortus Kewensis* under the name of *Limodorum Tankervillæ*. A peculiar interest attaches to this plant because it was in it and at Kew that in 1802 Francis Bauer, who was "resident draughtsman for fifty years to the Royal Botanic Garden," discovered and figured the "nucleus of the cell," an all-important body, the first description of which was published by Robert Brown in 1833.

In the first edition of Aiton's *Hortus Kewensis* 15 non-British species are enumerated as cultivated at Kew. Sir J. E. Smith wrote: "We

have scarcely seen any one species of this genus [Epidendrum], except in a dry state, before the year 1787, when *E. cochleatum* flowered at Kew, nor was it till October 1782 that *E. fragrans*, of Swartz, exhibited its rich and elegant bloom in the same rich collection. At present several species are to be seen flowering in the spring and autumn."

In the second edition of the *Hortus Kewensis* (1813) 115 species are enumerated, of which 84 are exotics belonging to 39 genera, "the greater number," John Smith states, in his *Records of Kew* (p. 228), "being epiphytal and natives of the West Indies, a few of the East Indies, Cape of Good Hope, and New South Wales."

According to the same writer Dr. Roxburgh sent a number of species from India in the early part of the present century. These, writes John Smith, "I found growing in 1822, on a shelf above a flue against the back wall in what was then called the propagation house; the *Aerides* growing and flowering freely, its roots clinging to the back wall, as also *Saccolabium guttatum*. There were also plants of *Dendrobium Pierardi* and *D. cucullatum* flowering freely, which had recently been brought home from Calcutta by Mr. Pierard." But it was to Roxburgh that English gardens owed, besides the first *Aerides*, the first *Dendrobium*, and the first *Vanda*.

These "back walls" are only seldom found in modern horticultural structures; but they were not without their merits.

At this period, with the exceptions above mentioned, the orchids at Kew "were potted in common soil, and the pots plunged to the rim in a tan bed." It is not surprising that their cultivation was attended with little success.

A little earlier than this the first step was taken in the direction of modern treatment. Sir Joseph Banks devised and carried out at Isleworth a method which was "one of the most successful modes of treating epiphytal orchids then known." Mr. H. J. Veitch, F.L.S., in his excellent historical account of "Orchid Culture, past and present" (*Journ. R. Hort. Soc.*, 1889, xi., pp. 115–126), remarks:—"This was the first rude forerunner of our modern orchid basket, and the first instance I find recorded of moss being used for surfacing" (p. 118).

According to John Smith (*Records*, pp. 229, 230):—"Between the years 1823 and 1825 a considerable number of species were received from Trinidad, forwarded by Mr. David Lockhart, the superintendent of the garden, amongst which were the first plants of *Stanhopea insignis*, *Oncidium Papilio*, *Lockhartia elegans*, *Catasetum tridentatum*, *Ionopsis pallidiflora*, and others, all of which were epiphytal, and many of them being sent growing on portions of branches as cut from the trees, which being accompanied by instructions from Mr. Lockhart as to how they should be treated, led to the successful cultivation of epiphytal orchids."

A whole generation was, however, to pass away before the culture of orchids was placed on an intelligent footing. Dr. Lindley during the middle part of the present century dominated the horticultural world. In 1830 he read a paper before the Royal Horticultural Society, in which, generalising from insufficient data, he concluded "that high temperature, deep shade, and excessive humidity are the conditions essential to the well-being of the plants" (Veitch, *l. c.*, p. 119). Thirteen years later he was substantially followed by Mr. Bateman: "except the important direction to give the plants a season of rest" (*l. c.*, p. 120).

The cultural treatment approved by Lindley "became, as it were, the only orthodox one, and was generally persisted in, in all its essential points, for upwards of thirty years."

Two men, however, broke away from the current tradition and with conspicuous success. "One of the first of these was Joseph Cooper, gardener to Earl Fitzwilliam, at Wentworth" (1835). "A still bolder innovation was adopted shortly afterwards by Paxton, at Chatsworth." In both cases the essential innovations were lower temperature and increased ventilation. The old tradition still, however, held its ground:—"plants perished under the barbarous treatment they received in the hot-houses of this country almost as fast as they were imported. To such an extent were the losses felt, that Lindley, in a remarkable article published in the *Gardeners' Chronicle* towards the end of 1859, pronounced their treatment 'a deplorable failure,' and which Mr. Bateman also some years later characterised as 'incredible folly'" (Veitch, *l. c.*, p. 123).

The first great step in the improvement of orchid culture was "the heating of glass-houses by means of hot-water pipes, which were first used for this purpose on a small scale by Mr. Anthony Bacon, at Aberaman, in Glamorganshire, and afterwards by the same gentleman at Elcot, near Newbury. The inventor of the process is said to have been a Mr. Atkinson" (Veitch, *l. c.*, pp. 122, 123).

The same writer sums up in the following words the chief features of modern practice:—"Larger and more airy structures, with separate compartments for different climates (for large collections even separate houses); a lower average temperature, the admission of more light and air, and a better system of heating, shading, and ventilation" (*l. c.*, p. 124).

It must, however, be admitted that a considerable number of species still refuse to submit to horticultural conditions. *Cattleya citrina*, many species of *Oncidium*, and the beautiful Cingalese *Dendrobium MacCarthiæ* are examples familiar to every orchid grower.

One species, however, that is usually found to be intractable, *Diacrium bicornutum*, has always been grown at Kew with little difficulty. On the other hand it seems impossible to grow *Disa grandiflora* there with the success that attends its cultivation at Edinburgh and Chatsworth. Perhaps the most baffling genus of all is *Anæctochilus*, the species of which, under apparently identical conditions, will sometimes flourish with facility, while at other times, for no discoverable reason, they refuse to grow at all.

In 1845 the span-roofed house, which now forms the east wing of the Tropical Fern House (No. II.) was erected on the site of an old stove (No. 3 of Dr. Lindley's Report). Sir William Hooker described it (in 1846) as "occupied with a rich and inestimable collection of orchideous plants (of which a great proportion was presented by Her Most Gracious Majesty)." This gift was recorded by him in 1844 as "the entire and valuable collection of orchideous plants formed at Woburn Abbey, which on being offered to Her by the present Duke of Bedford, Her Majesty was graciously pleased to accept and to send to the Royal Gardens at Kew." Continuing Sir William Hooker's account of the house:—"the centre is filled with a handsome slate staging, so large as to admit of a raised walk through the centre, thus enabling the visitor to look down upon each side of the house, while, over his head, and from the rafters on either hand, are suspended wire baskets filled with beautiful tropical epiphytes . . . As the house in question opens on to another and cooler stove (No. 2, now the west wing of No. II.), we are enabled to remove the splendid epiphytes, when in blossom, to a less heated atmosphere, and thus preserve them in beauty for a much longer

time. The orchideous house is assuredly one of the most interesting among the novel features of the establishment."

In 1847 Sir William Hooker further recorded :—"The orchideous house . . . has proved admirable for its structure, mode of heating, and the general arrangement; the plants, which have been increased [1846] by the noble bequest of the Rev. J. Clowes, of Broughton Hall, near Manchester, who willed his splendid collection of *Orchideæ* to the Royal Botanic Garden." It is somewhat remarkable that this is the only bequest which the orchid collection at Kew has ever received.

Many of the orchids, however, did not thrive in the house provided for them, which proved too large for the smaller species. These were therefore removed to the present orchid pits (now No. XVI.) about 1851. From about 1855–1862 part of the collection was maintained in some old fruit-houses in the present herbaceous ground, which had been remodelled and heated by hot water. In 1863 the whole of the orchids had been removed to these houses and they remained in them till the erection, in 1869, of those in which they are now exhibited to the public. The old houses were pulled down.

The orchid pits (XVI a & b) are amongst the oldest structures in the establishment. They are the "double propagating pits" of Dr. Lindley's Report (1840). The north end is formed by the only remaining portion of the wall of Methold's garden (it having originally belonged to Methold House, the Director's present official residence), which was added to the Botanic Garden in 1846. These pits were heated with hot water in 1842 and rebuilt on more modern principles in 1884. The small Masdevallia house (XVI c) to the north was reconstructed in 1893.

According to John Smith (*Records*, p. 235), "in 1848 the number of species cultivated at Kew amounted to 755 and in 1850 to 830." By the same authority it is stated in 1861 to have been 638. In 1868, according to the *Botanical Magazine* (t. 5692), "Kew only possessed about four hundred epiphytic orchids"; in this enumeration there is probably some error, as in 1872 the number of species and varieties in cultivation was 851 belonging to 138 genera. Since that time the collection has steadily increased.

The *Kew Bulletin* for 1891 (pp. 52–75) contains a list of the orchids, 766 in number, which flowered in 1890.

One striking evidence of the mastery which horticulture has gradually acquired over this difficult branch of cultivation is the successful production and rearing from seeds of hybrids.

This commenced with the work of Dominy in the nurseries of Messrs. J. Veitch and Sons at Exeter in 1853, and it has been continued ever since with increasing interest and success. It has not been without its scientific value in indicating that many genera, reputed to be distinct, are more closely related than had been supposed. The great range of species which Kew has at its command suggests attempts of this kind. And in the genus *Disa* it has produced crosses which are easy of cultivation and will probably become popular as ornamental plants.

For the convenience of cultivators a reference has been given, as far as possible, to a published figure under each species. Where available, those in the *Botanical Magazine* have been cited. In other cases preference has been given to the most easily accessible figure. It must, however, be noted that a species is, in many cases, figured under a different name (synonym) to that cited in the Hand-list.

A few names current in gardens have been included which have not as yet received a final botanical revision; these are indicated by the abbreviation "*Hort.*" appended to them.

Water Supply.—During the past year an important addition to the pumping machinery has been made by the erection of a triple expansion high duty engine as an auxiliary to the compound beam engine which was supplied by Messrs. James Simpson & Co. in the year 1864. The new engine represents the very latest development of the direct-acting type which has been adopted by the majority of the water companies at home and abroad. It has two high-pressure, two intermediate, and two low-pressure cylinders, arranged in line, and driving the pumps direct by prolongations of the piston rods, the dimensions of the cylinders being 8 ins., 11 ins., and 19 ins. respectively. All cylinders are steam jacketed.

The special features of this class of engine are the very small amount of fuel expended per indicated horse-power, and the smoothness and efficiency in working. The discharge from the pumps being practically continuous there are no shocks upon the mains and they are consequently free from the fluctuations of pressure which attend the working of engines of the old type. The new engine has been designed and manufactured by Messrs. James Simpson & Co., of Grosvenor Road, Pimlico, and the general finish of the work is of the highest class.

The British Honduras Pine.—There has long been an impression in the colony of British Honduras that there are two species of pine on the "Pine Ridges," distinguished, as Dr. D. Morris, the Assistant Director, states (*The Colony of British Honduras*, p. 57) as white and yellow pine, "and supposed to be characterised in the one case by rather smooth and compact bark, and in the other by rather thick, spongy, and rough bark." He, however, was unable on the spot to find any botanical characters to separate what were pointed out to him as the yellow and white kinds; and the specimens sent by him to Kew were identified as *Pinus cubensis*, Griseb. The present Governor, Sir Alfred Moloney, has sent further material which confirms the original identification. Grisebach (*Catalogus Plantarum Cubensium*, p. 217) distinguishes two varieties, which may prove specifically distinct as Wright, the collector, seems to have thought. The one has *foliis ternis, raro geminis;* the other *foliis geminis, raro ternis*, associated with differences in the cones. The latter is named var. ? *terthrocarpa*, Wright. The Honduras Pine is the same as the former, and therefore the original *P. cubensis*, Griseb. It is true that the leaves sometimes vary in number, as indicated above, in both varieties, and on the same branch; but there is not sufficient material at Kew to settle the question and define the species. The two other known West Indian species, *P. occidentalis* and *P. bahamensis* are easily distinguished; the former having the leaves in fives, and the latter very long leaves; but the

numerous Mexican and Central American forms require critical revision before the limits of the species can be defined. There is one point in connexion with the shape of the leaves in cross section which does not appear to be very generally known. It is this: when there are two in a sheath they are concavo-convex; when there are three in a sheath they are biconcavo-convex, the inner face being concave or biconcave. So far as the Kew material goes, all the leaves of the Honduras specimens appear to be in threes.

Sir Alfred Moloney also sent specimens of the Honduras oak (*Quercus virens*) which, like the pine, descends to the sea coast, and is associated with palms and other trees of tropical types.

Beetle larvæ attacking Orchids.—Sir Trevor Lawrence, the President of the Royal Horticultural Society, submitted to Kew pseudobulbs of *Dendrobium Imperatrix* attacked by larvæ. Mr. W. F. H. Blandford, Lecturer on Entomology at the Forestry branch of the Indian Civil Engineering College, has kindly furnished the following report upon them:—

These are beetle larvæ, and pretty certainly those of a Longicorn-beetle. They show, however, some slight divergences from the ordinary type of Longicorn-larva, correlated, I believe, with their habitat, in a soft stem instead of hard woody tissues.

It is quite impossible to identify such larvæ except when their mode of life is such as to exclude any doubts. But it happens that the larvæ of the only two known species of the genus *Diaxenes*, Waterh., live in orchids.

The first species, *Diaxenes Taylori*, Waterh. (*Ann. & Mag. Nat. Hist.*, ser. 3, vol. xiii., p. 128) was described from an example found in the Royal Nursery, Chelsea, where it was gnawing the stem of a *Phalænopsis* from Manila. Three examples in the British Museum are ticketed "Moulmein."

The second species, *Diaxenes dendrobii*, Gahan (*Ann. & Mag. Nat. Hist.*, ser. 6, vol. xiii., p. 520) is known by four specimens taken alive on imported orchids. The species of orchid were *Dendrobium atropurpureum* and *D. nobile*, the last imported from Moulmein.

Whether the larvæ before me belong to either species of *Diaxenes*, or even to the genus must necessarily remain unknown, unless the beetle be bred from them. But I should conjecture that, from the habitat of the host-plants, it will prove to be distinct.

Should Sir Trevor Lawrence be so unlucky as to breed out the beetles in his conservatory, I should be glad to see them and examine them. But for the sake of the orchids, I would recommend that they be carefully looked over and the affected stems destroyed. If any plants are so attacked as to be not worth saving they might be removed to a house which contains no other orchids, and covered with gauze netting so as to detain any beetles which may breed out, if it is desired to rear them for examination.

But it is most important that by careful supervision no affected stems shall be left which will distribute the insect at large in the orchid-house when they have reached the winged stage. It might be possible to save pseudobulbs not as yet badly injured by destroying the enclosed

larva with a wire or needle, but whether this means is practicable or not must be left to the consideration of those who have care of the plants.

WALTER F. H. BLANDFORD.

I may add that I have described a small boring-beetle (*Xyleborus morigerus*) which has been very injurious in some conservatories to *Dendrobia* from New Guinea, having probably been sent out extensively with the orchids by a firm of nurserymen. It is, however, not present in the portions sent.

Solanum torvum in Assam.—The following note is extracted from a *Report on a Botanical tour in the Lakhimpur district of Assam*, by G. A. Gammie, Assistant, Government Cinchona Plantations, Mungpoo (*Records of the Botanical Survey of India*, i. pp. 70–71) :—

"The military outpost of Sadiya, situated close to the right bank of the river, is surrounded by far reaching stretches of grass savannahs interpersed by coppices of small trees. A large annual bazaar was formerly held here to the mutual advantage of traders from the wild tribes in the mountains and merchants from the low countries, but I believe they were discontinued a year or two ago on account of the virulent epidemics which broke out among these large gatherings of people.

In favourable situations in Sadiya the trees are of noble growth compared with those that form the copses.

In addition to the grass lands at this isolated settlement a remarkable feature is the sterile aspect of some very large tracts covered by a close scrub composed of *Solanum torvum* and *Flemingia congesta*, but principally the former.

Regarding this plant Captain W. H. Lowther sounded a note of alarm in the *Journal of the Agri-Horticultural Society of India*, Volume xi. (1861), page 290. The article is entitled "On the mischievous increase of a gigantic species of *Solanum* on the North-East Frontier of Bengal, more especially in the Tea Districts of Assam."

He states that the plant was identified as *Solanum torvum*, Swartz, and that it promised to be one of the most stubborn and formidable antagonists with which Indian agriculture would ever have to contend.

So far as he could ascertain the plant only forced itself on notice some ten or twelve years before in Upper Assam where its rapid growth and productiveness had earned for it an evil repute. The fruits are too nauseous to be palatable to human beings, but they are devoured by many animals and birds and the seeds always pass undigested.

The military outpost at Saikwa on the Brahmaputra was deserted chiefly because it was overwhelmed by this plant, which no outlay could diminish or keep in check, and now, at Sadiya, on the opposite bank, the same state of affairs seemed imminent. The heaviest growth is observed on recently deserted fields.

Fortunately we can say, after the lapse of 33 years, that the writer's fears have not been realised and, although *Solanum torvum* is still a pest in the deserted homesteads of Upper Assam, it readily succumbs to the influence of careful and continuous cultivation. Where it flourishes (and that is never in the forests), it stands bearing eloquent

testimony to the pernicious results caused by "joom" cultivation, a custom still followed by the mountain and sub-mountain tribes, but this system is now greatly checked and will soon be traditional in the settled districts. Many areas of valuable land abandoned by indolent cultivators are overrun by this *Solanum*, with other equally harmful shrubs and by many species of strong coarse grasses, long before a more valuable type of vegetation is strong enough to compete with them on equal terms."

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

Nos. 111–112.] MARCH and APRIL. [1896.

DVII.—BOTANY OF FORMOSA.

The island of Taiwan—known to Europeans as Formosa—lies 90 miles east from the coast of the Chinese province of Fu-djen. It is about 150 miles from the seaport of Amoy and contains an area of 15,000 square miles and an estimated population of 2,000,000. The back bone of the island is formed of a range of densely wooded mountains containing several peaks, the highest, Mount Morrison, reaching a height of nearly 13,000 feet. A striking feature of the western side of the island is the rapidity with which the land is gaining on the sea. "An old Dutch picture shows Fort Zelandia with richly laden argosies of the Dutch East India Company drawing many feet of water anchored close to the old fort in a position now over a mile from the sea." The climate is humid and tropical. "The mean temperature at sea level is about 75° Fah. for the whole year, about 72° for the seven cool months and about 83° for the remainder." There are two treaty ports, Tamsui and Tainan. Tea was exported in 1893 to the extent of 22,000,000 pounds. Sugar is produced in moderately large quantities, but the quality is inferior. Camphor is rapidily becoming a considerable industry. "Coal is spread almost all over the island."

These facts are taken from a Foreign Office Report on Formosa prepared by Mr. N. Perkins, Assistant in Her Majesty's Consular Service, stationed at Anping (Tainan), in the south of the island (F.O. Commercial No. 1, 1896). Appendix B, attached to this report, supplies a singularly interesting sketch of the flora and economic botany of Formosa, by Mr. Augustine Henry, F.L.S., who is well known for his extensive botanical explorations in various parts of China. As no complete account of the flora of Formosa has yet been published, Mr. Augustine Henry's notes, therefore, possess special value, and by permission of the Secretary of State they are reproduced in the *Kew Bulletin*:—

The materials on which our knowledge of Formosan plants is based all practically lie in the Kew and British Museum herbaria, there being very little in Continental or American institutions. The "*Index Floræ Sinensis*," now being published in parts by the Linnean Society, has utilised these materials to some extent only, for since the appearance of the earlier parts especially large collections have been sent to Kew, which are as yet unworked. No adequate account of the flora

has been written, nor is it even now possible to do so, for the most interesting half of the island, the mountainous portion, has not been botanized over, except in a meagre way, by native collectors of my own in the southern part, and by one or two Europeans in the north, who have made short excursions from Tamsui. The chief early collectors, Wilford and Oldham, seemed to have touched the coast only at a few points. Swinhoe, who did so much for the fauna, collected a few plants. Tamsui has been visited by Mr. Ford, of Hong Kong, and Mr. Hancock collected most of the ferns in that neighbourhood, but paid little attention to flowering plants. The Rev. W. Campbell some years ago made a collection in the centre of the island, which was, however, unluckily much injured by accidental immersion in a flooded stream while it was being taken coastwise. This collection is now embodied, so far as it was available, in the herbarium of the British Museum. Some three or four years ago Mr. Playfair, while acting as consul at Tainan, made an admirable collection of about 400 species, chiefly from the immediate neighbourhood of Takow, with a few species from Anping and Taiwanfoo. His collection includes, perhaps, a decade of new species and a considerable number of plants hitherto only recorded from the Philippines and from the Indo-Malayan region.

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During 1893 and 1894 I myself have made large collections at Takow, both on Apes Hill and on the plain, and increased Mr. Playfair's 400 Takow species to over 600. Also, following a practice that was a success at Ichang, I employed native collectors, living at distant places, who bring me specimens of everything they see in fruit or flower, and in this way I have obtained a large quantity of material from two districts, one the neighbourhood of Bankimsing, a village situated at the base of the lofty Kalee Mountain, 30 miles east of Takow, the other from South Cape and the surrounding mountains, where, under the guidance of M. Schmüser, one of the lightkeepers, the savage chief "Capting" made a splendid collection.

Both these localities I visited, but was only able to spend a day or two at each. I do not think that anything has been collected by us at a height of over 3000 feet, so that the higher mountains and valleys are as yet virgin soil, and richly tempting to the explorer. Duplicates to over 2000 numbers have been sent by me to Kew, comprising, perhaps, 1000 species in all. Of publications on the flora of Formosa I have mentioned the "*Index Floræ Sinensis*," which is incomplete, as the earlier parts make no reference to Mr. Playfair's collection, and my own collections have not arrived in time to be included in any of the eleven parts published. Mr. Hancock, in the Customs Trade Report on Tamsui for 1881, has drawn attention to the more striking constituents of the flora of the north end of the island, while his account of the agriculture is interesting. I notice he refers to small plots of *Caladium*, by which I dare say he means "taro," a species of *Colocasia*. One meets continually in books of reference on China with this word *Caladium*, which seems to be applied loosely to *Aroideæ* in general, and even to the common "arrowhead" (*Sagittaria*). *Caladium* is a distinctly American genus, and there is no proof that any species of it is cultivated in China, much less that any occurs in a wild state. Mr. Hosie, in his Report on the Island of Formosa, 1893, has treated of the economic botany, but some errors have crept into the botanical nomenclature which I may now set right. The indigo of Formosa is produced by the common papilionaceous shrubs, *Indigofera tinctoria* and *I. Anil*, much cultivated in India and on the mainland of China, where the latter

also occurs wild. *Polygonum tinctorium*, the dyer's knotweed, is cultivated in Manchuria and Japan, but not in Formosa, while *P. orientale* and *P. chinense* are common wild plants in China and Formosa, which do not produce indigo at all. There is no trustworthy evidence, such as specimens of the plants being gathered, available, to enable us to give specific names to the species of banana reported to be made into cloth by the savages in the northern mountains, and to the plant furnishing the rattans exported from Tamsui. The castor-oil plant common, wild in Formosa, is *Ricinus communis*. The sugar-canes cultivated in Formosa comprise two or three varieties of *Saccharum Officinarum*. Too little is known of the flora to enable any speculations on the distribution of the plants met with to be of value, but from the species known to me it is evident that there are many elements in the flora, which I shall now point out.

1. *Endemic Element.*—A good number of species are peculiar to the island. Some of these are very vigorous and abundant, whilst others are met with only in exceptional situations, and are, perhaps, dying out. An exploration of the valleys of savage territory will greatly increase the number of these species, if one can judge from the results obtained by explorations of Central China and Japan.

2. *Flora of the cultivated Plain.*—This is practically the same as that of the Indian plain, and in it I include the littoral flora, which scarcely has a single endemic species.

3. *Plants occurring only in Formosa and the Philippines.*—These occur chiefly, if not altogether, in the south.

4. *Flora, common to Formosa, Japan, and Central China.*—These species occur in the mountains chiefly. Striking examples are the varnish tree (*Rhus vernicifera*), of which no use is made in Formosa, brought to me from the Kalee Mountain; *Idesia polycarpa*, a noble timber tree, discovered by Maximowicz in the mountains of Japan, and since found in mountain forests in Hupeh, and in the same part of Formosa as the last-named tree; *Deutzia scabra*, a shrub with pretty white flowers, common on Apes Hill and throughout Formosa, &c.

5. *Outliers of the Australian Region.*—The best example of this is the very common timber tree (*Acacia Richei*), hitherto only met with elsewhere in Fiji, but I believe it is seen near Amoy, where possibly it may have been introduced by emigrants returning from Formosa. It is the most characteristic Formosan tree, occurring from north to south, in the plain and on the mountains. It belongs to the large section of the genus *Acacia*, in which the trees or shrubs bear phyllodes, or modified leaf stalks, instead of true leaves. These are set on the boughs in the vertical plane, and not in the horizontal, as ordinary leaves are. The wood of this tree—the "sung-ssŭ" of Formosans—is much used for frames of junks, rudders, cross-bars of anchors, beams of houses, &c.

6. *Introduced Plants, now naturalized, and not to be distinguished in habit from true Natives.*—These include a good number of American plants, introduced either intentionally or accompanying seeds of other plants.

I will, however, first mention the cultivated American plants, which are not naturalized, but require man's attention to keep them from dying out:—

Maize (*Zea Mays*), tobacco (*Nicotiana Tabacum*), pine-apple (*Ananas sativus*), sweet sop (*Anona squamosa*), sweet potato (*Ipomœa Batatas*).—This is the species or variety which is cultivated in Formosa, whereas at Ichang it is *Ipomœa fastigiata*, and Mr. Hemsley is of opinion that the latter, which occurs wild in the Andes, is the

parent of the former variety, which is only met with in cultivation. Truly naturalized plants of American origin are :—

Guava (*Psidium Guayava*), everywhere wild in South Formosa, called "Na-pot" by Chinese, chilli (*Capsicum annuum*), tomato (*Lycopersicum esculentum*). The wild form bears small red fruit, not larger than a marble, and it is to be met with far away from European settlements. The tomato is not cultivated by Formosans.

Jatropha Curcas, an euphorbiaceous tree, of small stature, bearing capsules containing three seeds, which yield an oil on pressure. This tree is littoral in habit, and, while known as "T'ung Yu-shu," a name more properly given to the wood-oil tree (*Aleurites cordata*), does not seem to be utilized here. In Canton province the oil is used for lighting purposes.

Pachyrhizus angulatus, a large climbing papilionaceous shrub, with handsome purple flowers in autumn. The root is shaped like a turnip, and is much cultivated in Kwangtung, where it is known as "fan ko" (*i.e.*, foreign "ko").* It is only slightly cultivated in Formosa, but in the wild established state it is common enough.

Pithecolobium dulce, the chin kuei, or golden beetle tree, occurs at T'aiwanfoo.

Hyptis suaveolens, a herb with blue flowers, everywhere amidst grass in the hills, is highly scented.

Hyptis capitata, another herb, liking moist places, with white flowers in a head, is naturalized in Formosa, but, unlike the last species, it has not been met with on the mainland.

The castor-oil plant (*Ricinus communis*) and *Euphorbia Tirucalli* are supposed to be African in origin. Both are quite established. The last is a practically leafless shrub, with dark green boughs filled with an acrid milky juice. Its mode of propagation is puzzling. So far as I have seen the majority of the shrubs bear flowers, which are always female, and do not come to fruit. I have never seen fruit or staminate flowers, and I believe such are unknown in herbaria. Branches, then, with staminate flowers, or with fruit, lopped off and put into spirits by any lucky observer, should be sent to Kew.

A comparison of the floras of Takow and Hong Kong, both in much the same latitude, and only separated by some 300 miles of shallow sea, brings out a striking unlikeness. I may adduce a single instance. Two mangroves occur on the shores of the Takow lagoon—*Rhizophora mucronata*, the common mangrove, and *Brugiera cylindrica*; the first has yellow, the latter red flowers. These do not occur in Hong Kong, but are replaced by two species belonging to quite different genera. If we compare with Hong Kong, and its peak of 1600 feet elevation, an equal area about Takow, including Apes Hill, of 1100 feet elevation, it will be found that the latter area has only about half as many species, while endemic species are much more numerous in Hong Kong.

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The plants met with on the sea shore, and not occurring inland, are (about Takow) the following :—

The mangroves and *Jatropha Curcas*. *Avicennia officinalis* is sometimes called the white mangrove, from the colour of the bark. It occurs

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* The native "ko," also a large woody climber with papilionaceous purple flowers, is common wild in China, Japan, and Formosa. It is *Pueraria thunbergiana*. From the root, which, chipped, is used as a drug, a kind of arrowroot is produced, while the fibre of the stems is made into cloth, especially at Kiukiang, in Corea, &c.; but the plant, which occurs in the Formosan mountains, is not utilized here in any way.

in the swamps, belongs to *Verbenaceæ*, and has yellow flowers and curious fleshy fruit.

Excæcaria Agallocha, known as the "hsiang shu" (fragrant tree). It occurs on the shores of the lagoon. In old trees the wood of the trunk near the ground often becomes transformed in part, changing in colour from white to reddish black. These bits of probably diseased wood burn readily, with a slight odour, and are used locally as a substitute for the true *Garoo* wood, which occurs in Hainan, and is supposed to be the product of a different tree, *Aquilaria Agallocha* or *A. malaccensis*.

Pongamia glabra, a leguminous tree on Takow spit.

Terminalia Catappa, a tree with large oval leaves, occurring in the same locality.

Tournefortia sarmentosa, a common climber, with white cymose flowers and white fruit. An allied species, *T. argentea*, with very thick, velvety, silvery leaves, occurs as a small tree at South Cape.

Ipomœa biloba, a common creeper in the sand, with bifid leaves and bright purple flowers.

Vitex trifolia, common creeper with small blue flowers. I have never seen it but in its unifoliolate variety.

Canavalia obtusifolia, a large climbing papilionaceous shrub, with beautiful red flowers, and large broad thick pods.

Vigna lutea, similar, but with pale yellow smaller flowers, and narrow round pods.

Vinca rosea, periwinkle, is naturalized on Takow spit.

Lumnitzera racemosa, a low shrub with white flowers, occurring in the mangrove swamps.

Euphorbia Atoto, a sea-sand spurge.

Tribulus terrestris, with yellow flowers and spiny fruit, prostrate in sandy places.

Pemphis acidula, a low shrub with white flowers, occurring on wave-washed rocks.

Spinifex squarrosus, a dioecious grass.

A *Sedum* with yellow flowers on sea-side rocks.

Scævola Kœnigii, a shrub.

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The common large trees in the neighbourhood of Takow are :—

Mangifera indica, the mango, wild and cultivated.

Buchanania arborescens, a tree akin to the mango in foliage and inflorescence, but with small inedible fruit, known as the "shan shuai."

Nephelium longana, the lung-an, wild and cultivated. Lung-ans are a staple export.

Ficus retusa is the common banyan tree here.

Ficus wightiana, a less common banyan tree, is readily distinguished by the inflorescence occurring on the leafless part of the boughs.

Ficus beecheyana, occurs as small shrub and tree of 20 feet or more in height; large pubescent leaves.

Ficus leucantatoma, also variable in stature, with large glossy leaves and flattened globular inflorescence.

Broussonetia papyrifera, the paper mulberry, not utilized in Formosa.

Erythrina indica, a thorny tree, with large trifoliolate leaves and magnificent red papilionaceous flowers, known as the "tz'u t'ung."

Macaranga Tanarius, with large peltate leaves, known as the "hsieh t'ung."

Bischofia javanica, with trifoliolate leaves, known as the "ka-tang" (in the local dialect). The wood is good, and used for making furniture.

Melia Azedarach, the pride of India, "k'u-lien."

Neither the common loquat nor the rare Hong Kong species occurs in Formosa, but a very large, and perhaps new, species of *Eriobotrya* occurs near Takow and at the South Cape. The fruit is smaller than the mainland loquat, and has little flavour.

An ash (*Fraxinus* sp.) occurs rarely about Apes Hill, but it is common in the mountains.

The wood-oil tree (*Aleurites cordata*) was found by Mr. Playfair on Apes Hill, but it is very rare, and no commercial use is made of its product in Formosa.

Cordia Myxa produces a viscid fruit, eaten by the natives with soy and garlic, and named "p'o-tzu."

The vegetable tallow tree, *Sapium sebiferum*.—The fruit is not utilized in Formosa.

Sapindus Mukorossi, common on the cliffs as a shrub, is occasionally seen as a large tree. The fruits are not so much used here in lieu of soap, as they are in many places on the mainland.

Bombax malabaricum, the silk cotton or "moc-main" tree, known to the natives as "pun-chi," is a thorny tree with red tulip-like flowers and large capsules, containing the silk-cotton. It is not collected in Formosa.

Amongst smaller trees worthy of notice are the following:—

Laportea pterostigma, a tree of the nettle family, with large leaves which sting violently.

Ehretia formosana, the "houk'o" or "thick bark" has hard wood, which, however, splits on drying. *E. macrophylla* and *E. acuminata* also occur.

Pittosporum sp. nov. the "kiehjiu," is very common, and has hard wood.

Mallotus cochinchinensis, *M. Playfairii*, and *M. philippinensis* are small trees or shrubs, while *M. repandus* has a somewhat climbing habit.

Hibiscus tiliaceus grows to be a fair-sized tree. Its bright sulphur-yellow flowers change as the day advances to a dark maroon colour.

H. mutabilis, smaller, has white flowers changing to pink towards evening.

Murraya exotica, the "shih-ling," is a small tree with fragrant white flowers, easily seen to belong to the orange family.

Leea sambucina, a beautiful shrub or small tree, with large much-divided compound leaves and a mass of red inflorescence, the individual flowers as they open being pale yellow. This tree belongs to the vine family, from which it differs so markedly in habit.

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Caesalpinia, which is wrongly styled "acacia" by some Europeans in China, is represented by three species:—

C. pulcherrima, an erect shrub with gaudy red flowers, much cultivated. I have seen no wild specimens.

C. Nuga, a large thorny climbing shrub, with masses of bright yellow flowers and smooth short broad pods.

C. Bonducella, also a large thorny climber, with inconspicuous yellow flowers and spiny broad pods.

Two other common leguminous climbers on Apes Hill are:—

Millettia reticulata, with purple flowers.

Bauhinia Championi, readily distinguished by the characteristic bifid leaf of the genus and long racemes of white flowers in September.

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Ginger (*Zingiber officinale*) and turmeric (*Curcuma longa*) are cultivated, the latter being a large export from Anping. *Canna indica* is a common cultivated flower. Two species of wild *Zingiber* occur in the Bankimsing Mountains, and a very conspicuous *Alpinia* with beautiful flowers is everywhere common. It is *A. nutans*. Mats are occasionally made of the leaves.

A tall and graceful plant with white flowers in July occurs on Apes Hill and in the bamboo groves on the plain. It is *Costus speciosus*.

The *Arum* family is doubtless well represented in the mountains, but satisfactory specimens for the herbarium are difficult to prepare, and so my native collectors have shirked them. Mr. Morse sent me an *Arisaema* from Tamsui. On Apes Hill and at the South Cape *Alocasia macrorhiza*, with large white flowers and leaves sometimes 3 feet in breadth, is common, and has been carried into cultivation as an ornament of European houses on the mainland.

A new species of *Amorphophallus* is met with on Apes Hill, distinguished by its tuber, like a large potato, which puts forth a single flowering stalk, expanded above into a hollow organ, covered with bristles, dull red or purple in colour, and a gruesome sight. In the following year the tuber sends up a stem bearing three much-divided leaves. A still larger species of this genus, with a tuber 8 or 9 inches in diameter, occurs in the Kalee Mountains. An enormous climber ascending to the summits of the loftiest trees occurs in the mountains, both in the south and at Tamsui, and there are two or three examples of it near the Laiwee village close to Takow. This is *Epipremnum mirabile*, the Tonga plant, with large leaves indented and loopholed. This plant is said to be a specific for neuralgia.

Pothos Seemanni is a common climber on cliff walls.

The most common palm is *Phoenix humilis*, which occasionally attains 10 feet in height. It bears small edible fruit of the same flavour as the date.' It is known here as "kuang lang," the name in Kuangtung Province of the tall palm, *Caryota ochlandra*, which produces the coir of South China. A very graceful species of *Arenga* or "sago palm" (*A. Engleri*) is common at Tamsui and on Apes Hill, Takow, and is widely spread in the mountains. It has been introduced into the Hong Kong Botanic Garden by Mr. Ford. It bears a small quantity of coir, and is therefore styled "tsung" by Formosans, which is the name given in Central China to *Trachycarpus excelsa*, generally known as "Chamaerops," the palm which produces the coir of Central China. The *Areca* palm is cultivated on the plain, and I have specimens of a species of *Trachycarpus* from savage territory.

Around Takow there are two species of bamboo very common, the "chi tik" or thorny bamboo, much used for fences, and the "lik tik," which has broad leaves. This occurs wild, and is also much planted for its excellent bamboo shoots. I have obtained flowering specimens of the latter, so that it can be identified, but have failed to obtain flowering specimens of the former, and also of the very large bamboo, "mao-chu" (hairy bamboo), which is used in making the sea-going catamarans. Specimens of bamboos showing both foliage and inflorescence are very valuable, and the special attention of travellers is directed to obtaining and sending them to Kew for identification. Most bamboos only flower when they have attained a mature age, flower once

only and die. Two species of reed are common. *Ischæmum angustifolium* occurs on the sea face of Apes Hill, and is a grass peculiar in the fluffy nature of the base, out of which the culms spring. It is the "Bhabur grass" of India, where it is used as a good material for making paper.

The sugar-cane, *Saccharum Officinarum*, is much cultivated, and at least three varieties occur, only one of which I have been able to obtain in flower. The cereals include rice, of which five varieties of the common kind are noticed in the Paris Exhibition catalogue. In addition, glutinous rice occurs, and two peculiar kinds, red rice and black rice, which I have not been able to investigate. The black rice is very dear, being used as a medicine, made into an infusion like tea. Wheat is cultivated as far south as the South Cape. Barley occurs in the centre of the island. Maize, common sorghum (*Sorghum vulgare*), and some kinds of millet (*Setaria*) are met with, but to no great extent. Job's tears (*Coix Lacryma-Jobi*), which is always erroneously styled "pearl barley" by Europeans in China, also occurs. It may be noted that *Sorghum saccharatum*, which is cultivated in the Yangtzu Valley, is *not* used by the Chinese for making sugar. This plant is now cultivated largely for that purpose in the United States, where it is sometimes known as the "Chinese sugar-cane," a misleading term.

Cyperaceæ are numerous in species. "Kiam ts'ao," *i.e.*, salt grass, occurs in brackish water, and the stems are much used for tying parcels and for making coarse mats. It is a species of *Cyperus*, but it is not the plant out of which the famous Taika mats are made. The latter are exported from Tamsui, and vary in price from two dollars to as much as 70 dollars each. They are used by the Chinese for sleeping on in summer, and occur in sizes suitable for that purpose. The dearest kinds are fine, even in texture, and with patterns, and can be rolled up into small compass; and one costing 70 dollars, such as might be made for the governor or the palace, may take three years in making. The plant is reported to occur only in cultivation, and to be confined to the neighbourhood of Taika, on the north-west coast. I have been informed that it is sown from seed, and lasts for several years, being cut down thrice a year. The fields are said to be kept irrigated with fresh water like rice fields. I am unaware that any foreigner has observed the mode of cultivation of the plant or the manufacture of the mats; the plant is unknown. There is here room for an interesting investigation, and I suggest that specimens of the plant in flower, with seed for sowing and details of cultivation and manufacture, be sent to Kew by the first traveller in the locality. The naming of *Cyperaceæ*, to which order the plant probably belongs, is difficult, and can only be done satisfactorily at some such establishment as Kew, where there are copious specimens to compare with. I may here mention that the naming of a new plant or the selection out of two or more names of the correct one in the case of a known plant is subject to definite rules, the chief of which is, that a name to be valid must have been accompanied at the time of bestowal with a sufficient description of the plant. When two or more such names happen to be given independently, then the prior name is the correct one, the spelling of the first name must be rigidly adhered to, and if descriptive in character it cannot be altered even when erroneous. We are not then at liberty, *e.g.*, to alter *chinensis* to *sinensis*, or *vice versâ*; and we cannot change *japonica*, even if, as is the case with some plants so called, the plant is not really a native of Japan.

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Economic Botany.

Some of the plants useful to man or cultivated in Formosa have been incidentally mentioned in the preceding sketch; but I shall now confine myself in the remaining part of this paper to plants of economic importance.

The edible *Leguminosæ* are the same as on the mainland. The garden pea (*Pisum sativum*), the Soja bean (*Soja hispida*), *Lablab vulgaris*, and several species of *Phaseolus*. The two following members of the order are worthy of note :—

Sesbania aegyptiaca, known as "shan ch'ing" (*i.e.*, wild indigo), is a slender shrub with yellow flowers and very long slender pods. It is planted chiefly as a help to the soil, being ploughed in when the stems are a foot or so high. Left to grow, it attains 5 or 6 feet, and is only useful as fuel.

Cajanus indicus, a tall shrub, known as the "shu-dou" (tree-bean), is cultivated for the seeds, which are ground into flour and used for making cakes. The Fukien name of this plant is "hiang dou."

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The following oil-producing trees and shrubs, but which are not utilized in Formosa, have been incidentally mentioned :—*Jatropha Curcas*, *Aleurites cordata*, *Ricinus communis*; and to this class may be added the varnish tree and vegetable tallow tree. Paper might be made out of *Broussonetia papyrifera*, and also out of a species of *Wikstrœmia*, which is common in Formosa, but unutilized; paper from it is a Pakhoi export. One of the most interesting Formosan products is the pith of *Fatsia papyrifera*, commonly known to Europeans as the "rice paper" plant. I can add nothing here to what is already known on the subject, but may mention that the plant also occurs in Ssü-ch'uan, and there is a considerable export of "pith" from Ichang and Hankow. I did not see the plant wild in Hupeh or Ssü-ch'uan.

Ordinary or laurel camphor I leave unnoticed, as I have not been to the districts of production.

A peculiar kind of camphor, of great value in the eyes of the Chinese, is distilled in Hainan from the leaves of *Blumea balsamifera*, a shrubby plant about 2 or 3 feet in height, belonging to *Compositæ*. This may be distinguished as "Ai" camphor, from the Chinese name of the product :—Ai-fen, the crude state; Ai-p'ien, the purified form. The plant does not occur on the Chinese mainland, but is common enough in India, Burmah, and Formosa. The Rev. W. Gilman, of the American Mission at Kiungchow, has sent me an account of the Hainan method of distillation, which I hope to see soon in the *Kew Bulletin*.* This plant is worthy of attention from a commercial point of view.

There are three chief fibre-yielding plants in cultivation :—

1. *Boehmeria nivea*, known locally as "t'oë," the "ch'o" of Pekingese, the nettle-hemp, yielding China grass fibre. Lately in the customs returns for Tainan it has been distinguished by the last name, but formerly it had here (and in other ports still has) only the general name "hemp," which in China includes several different fibres. Formosan "rhea fibre" is worth from 11 dollars to 20 dollars a picul ($133\frac{1}{3}$ lbs.), and is made into a particular kind of grass-cloth at Swatow.

2. Pineapple, the fibre of which in the local dialect is known as "ong-lai-ssü," and is worth about 24 dollars a picul. It is exported to

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* See *Kew Bulletin*, 1895, p. 275 (with plate).

Swatow, where it is made into the kind of grass-cloth distinguished as "ong-lai-ko."

3. Jute (*Corchorus capsularis*), the fibre of which is known to Europeans in China as "hemp skin," a too literal translation of the Chinese "ma-p'i." "Ma" is generic for textile fibres, "p'i" is "bark," referring to the outer bark of the plant, which is stripped off in long ribbons. Owing to the different preparation of the plant in China and in India the products look very different. The so-called "hemp bags" of customs returns are made out of this coarse Chinese jute, which is also used for making rope and string of inferior quality. The jute is worth from 2 to 4 dollars a picul.

Corchorus olitorius, an allied species, which is readily distinguished by its long narrow fruit, that of *C. capsularis* being globular, occurs in Formosa as a weed, and I have not ascertained that its fibre is ever used.

It may be here noted that the so-called Tien-tsin jute is the product of *Abutilon Avicennæ*, and should be named "Abutilon hemp." I have seen true or Russian hemp, the product of *Cannabis sativa*, the "huo-ma" of the Chinese, from Newchwang, but this plant is more cultivated in China for the oil from the seeds than for the fibre; and of flax (*Linum usitatissimum*), which is cultivated in North-western China, the same may be said. Occasionally small quantities of a fabric named "shan-hsi ma pu," are brought to Tien-tsin, and this is doubtless linen, but I have seen no specimen, and merely infer from the name. The fabric has been described to me as a kind of grass cloth.

Flax is "hu-ma," and the seeds are for sale in drug shops.

"Savage cloth" is a term applied to at least three different kinds of coarse unbleached fabrics made by the savages. The kind made near Tamsui is of China grass, but whether from wild or cultivated plants of *Boehmeria nivea* I am not certain. The wild plant is very common, and has a coarser fibre. In the Kalee Mountains "savage cloth" is made out of the inner bark of the roots of small wild mulberry trees, doubtless a variety of the very variable *Morus alba*. I have sent specimens of plant, root, fibre, and cloth to the Kew Museum. Game-bags ("bang-teh"), very serviceable, are also made out of this fibre by the savages, while similar ones are made out of China grass by the Chinese and Pepohuan. A third kind of "savage cloth" is made from the inner bark of *Sterculia platanifolia*, known in Formosa as the "ch'ing-t'ung" tree. I have not been able to get specimens of either fibre or cloth in Formosa, but specimens of fibre, and shoes made out of it, from Hupeh, have been sent by me to Kew. This tree has been utilized for its fibre from classical times, but the product is coarse, and only suitable for making shoes, ropes, &c.

Mr. Hosie mentions a fourth kind of "savage cloth," made out of banana fibre, but there is no certain information to hand about this.

"Dye yam," the large and dark red tuber of *Dioscorea rhipogonoides*, Oliver, a wild yam occurring in the southern mountains of Formosa. These tubers are locally used by the fishermen for dyeing and tanning their nets reddish brown; occasionally also their clothes are dyed similarly. The tubers are cut up into small pieces and put into large vats of water placed on a fire; the resulting red decoction is the dyeing liquid. The plant occurs in Hong Kong, and was first collected by Mr. Ford, who afterwards, on his trip up the West River, ascertained that the tubers so much used in the Kwang Tung Province were the product of this plant. It occurs also wild in Kwang-hsi and Tonquin, and enormous quantities are sent from the French colony into China by

way of Lungchow. The French call the tubers *faux Gambier*, but they are generally known in customs returns as "dye root," or "dye yam," "shu-lang" being the Chinese name. In addition to their use for dyeing nets, the Cantonese employ them for giving a peculiar gloss to certain cotton goods. Specimens have been sent to Kew and to the Pharmaceutical Museum, and if found to be of value in Europe as a dyeing or tanning material, doubtless large quantities could be exported from South Formosa, where the present price is about 2 dollars a picul. (*Kew Bulletin*, 1895, p. 230.)

"Ok-gue," the dried fruit of *Ficus pumila*, a common shrub, climbing over rocks; yields a peculiar jelly when treated with water, and is a common article of consumption amongst the Chinese in summer. It might be of value in the home market.

Very curious fans are made in Taiwanfoo out of the leaf of the "Areca" palm, which is planted considerably in South Formosa.

In the preceding notes I have not touched on many well-known local products, as ground nuts (*Arachis hypogaea*) and sesamum seed, both of which are considerable sources of oil.

Formosa is rich in fruits, of which pine-apples and "lung-ans" are the chief from a commercial point of view. Oranges, pumeloes, carambolas, pears, rose-apples, guavas, papaws, cocoanuts, sweet sops, bananas, &c., are also produced in quantity.

Tamsui exports certain kinds of seaweed (identified at Kew as *Suhria prestoides*, J. Ag. and *Gelidium Amansii*, Lamx.), tea, rattans (from an undetermined species of *Calamus*), tobacco.

"Medicines" is generally an interesting heading amongst exports from a Chinese port, but scarcely any, if one excludes camphor and turmeric, are exported from Tamsui or Tainan. "Sang-bai-p'i," the bark of the mulberry, and "mu-hu," a species of *Dendrobium*, occasionally are sent from Formosa.

"Capoor cutchery" and ginger are cultivated for local use, and in the Kalee Mountains a species of *Cinnamomum* occurs, different from *C. Cassia*, which the natives use in lieu of the true cassia bark.

Timber, when the mountainous country inhabited by the savages is opened up, will doubtless be an important article. I have already mentioned the common trees of the plain, most of which occur in larger size and greater number in the mountains, and I will now make a note of a few of the timber trees, which practically only occur in the mountain forests, reserving for a future occasion a discussion on the great number which have been collected by my natives. Very few species of conifers are known as yet from the island, but doubtless when higher altitudes than 3000 feet have been explored, more kinds will be found, if one can judge from the mountains of Japan and Central China.

Podocarpus Nageia, furnishing an excellent wood, has been sent me from Tamsui by Mr. Morse. The Chinese call it "shan-sha." An allied species occurs at the South Cape. Mr. Morse also sent me *Cunninghamia sinensis*, the "sha" tree of the mainland, so much used for making tea chests: but I am not certain that the specimen was indigenous. This tree is common in the mountains of South and Central China, and is often dubbed *Araucaria* by the non-botanical traveller. *Thuja orientalis* also occurs.

Oaks are abundant in species in the southern mountains. They all yield hard wood, and all have persistent leaves, and are possibly new species. At Tamsui an *Alnus* occurs; and at Takow, on the creek banks, a *Salix* is common.

Lauraceæ are numerous in species in the mountains; there are several species of *Machilus* with excellent wood. One of the local, "lam-a" wood ("nan mu" of Mandarin speech) is much used for making furniture, &c. The "siao lam" is another species. Camphor wood, of course, is common and excellent. *Ebenaceæ* are abundant. *Diospyros Kaki*, "the persimmon," is cultivated for its fruit. Another species occurs as a small tree on Apes Hill, while at the South Cape a third species, with large hairy fruit, is common; but the source of the ebony ("o-ma-ts'a"), which is highly valuable, and common in the southern mountains, is not yet satisfactorily made out.

Maples are scarce, perhaps three or four species in all. *Styrax*, *Symplocos*, *Eugenia*, and *Calophyllum*, and numerous other genera with excellent wood are well represented in the mountains.

DVIII.—NEW RUBBER INDUSTRY IN LAGOS—(continued).

(*Kickxia africana*, Benth.)

The rubber industry at Lagos of which an account was given in the *Kew Bulletin*, 1895, pp. 241–247 (with a plate), affords one of the most remarkable instances of the rapid development of an industry that has taken place in recent years in any British Colony. It owes its existence to a wild plant which was only discovered in Lagos within the last two or three years. It was found to be new as a source of rubber, although there is now reason to believe it had yielded some of that formerly exported from the Gold Coast. At the present time *Kickxia* rubber from Lagos has established itself as a commercial article in great demand. The exports in January 1895 were 21,131 lbs. of the value of 1214*l*. This was practically the beginning of the industry. In December 1895 the exports had increased to 948,000 lbs. of the value of 51,488*l*. 9*s*. 4*d*. From a recent return, communicated to Kew by the Government of Lagos, the total exports during the year 1895 amounted to 5,069,504 lbs. (2263 tons) of the value of 269,892*l*. 13*s*. 10*d*. This considerable industry has therefore been called into existence within 12 months. The rubber is purely a forest product, and the collection and preparation of it have been effected by means of native labour. The success of the industry is another indication of the undeveloped resources of our West African Colonies. It is only a few years ago that a somewhat similar though more gradual, rubber industry was called into existence at the Gold Coast. The origin of this is given in the following extract from a Colonial Office Report on the Economic Agriculture of the Gold Coast in 1889 (C. O., 110, 1890): "Although the youngest of our industries, the preparation of india-rubber is now only second in importance to that of palm-oil. Attention was first drawn to this valuable product by Sir Alfred Moloney (now Governor of Lagos) when administering the government of the Gold Coast Colony in 1882, by letters to the local press. The first practical experiments were made by Mr. F. C. Grant, of Cape Coast, whose example was quickly followed by others, and the undertaking proving remunerative, the collection of rubber began in every part of the colony. The quantity now produced annually ranges from 30,000*l*. to 40,000*l*. in value."

During the year 1893 the Gold Coast exported rubber to the extent of 3,395,990 lbs., and of the value of 218,162*l*.

The following details respecting the exports of Lagos rubber have been received from the Government of the Colony:—

Colonial Secretary's Office, Lagos,
January 13, 1896.

DEAR THISELTON-DYER,

I ENCLOSE a return showing the export of rubber during 1895. Tremendous, is it not? It seems to be the general opinion that there will be a considerable falling off this year, but I question if anyone can speak with any degree of certainty on this point.

We have had a good year on the whole; revenue, 142,000*l.*, the largest on record.

Believe me, &c.,
(Signed) GEORGE C. DENTON.

EXPORT of RUBBER from the Colony of LAGOS from 1st January to 31st December 1895.

Month.	Weight in lbs.	Value. £ s. d.
January	21,131	1213 10 8
February	15,888	777 0 11
March	26,316	1419 7 8
April	39,763	2078 16 6
May	216,916	11,700 0 7
June	268,619	12,577 2 6
July	461,765	22,593 13 3
August	354,990	19,951 18 8
September	673,160	36,172 19 9
October	1,059,158	57,117 1 10
November	983,394	52,802 13 0
December	948,404	51,488 9 4
Total	5,069,504	269,892 13 10

E. A. LOVELL, Collector of Customs.

DIX.—COFFEE PLANTING IN LAGOS.

Coffee planting is being energetically extended in West Africa. This part of the world is the home of more than one species yielding commercial coffee. Chief amongst these is the Liberian coffee which thrives at sea level. This has long been grown in the native state of Liberia.

Seeds of Liberian coffee were received at Kew in 1872 from a small plantation on the Secocm River near Accra on the Gold Coast. "The plants raised from these seeds at Kew were the first grown in this country. In 1874 and 1876 larger supplies of seed were obtained direct from Liberia, through the kind agency of Mr. James Irvine, of the firm of James Irvine & Co., of Liverpool. The plants were distributed from Kew to tropical botanical gardens throughout the Empire."—(*Kew Bulletin*, 1890, pp. 245–253.) Coffee cultivation is now being carried on under European supervision both at the Gold

Coast and at Lagos. In the latter colony the industry has originated in the efforts made in that direction at the botanical station established by the Government at Ebute Metta.—(*Kew Bulletin*, 1888, p. 149). The distribution of Liberian coffee and other plants from this station have been as high as 13,960 per quarter, or at the rate of 45,000 per annum. In 1892 (although a nominal price only was charged for the plants and in some cases many distributed free of charge to native chiefs) the total receipts amounted to more than 91*l*. What was apparently the first attempt at a regular coffee plantation in Lagos is described in the *Kew Bulletin*, 1893, p. 182.

In 1894 some Arabian coffee in parchment, grown at the botanic station at an elevation of only 20 feet above the sea, was valued in London at 94*s*. per cwt. It has been shown, however, that the more permanent sort to grow in the lowlands is the Liberian coffee, and samples of this were recently valued at nearly the same price. The curator, Mr. Millen, remarks in his Report for the quarter ending the 31st December 1894:—"There is no doubt that coffee has a great future before it on the West Coast. If properly cultivated and prepared it should be able to compete with any coffee-growing country."

In the Appendix to the Report on the botanic station for the quarter ended 30th September 1895 the following further particulars are furnished respecting the extension of coffee plantations in the colony of Lagos:—

It will probably be interesting to record the advancement made in *Coffee* plantations in this colony, which have originated through the establishment of this botanical station.

When returning from Abeokuta his Excellency the Acting-Governor gave me permission to visit two plantations situated near the Ado River.

The first one I visited was at Soto, and is owned by the Ilaro Estates and Plantations Company, Limited; it was commenced in 1892, and is under the management of Mr. Punch, a European, who took me round and kindly gave me quarters for the night.

Mr. Punch calculates that he has 150 acres under cultivation, which includes 50,000 plants of *Coffea liberica*. These plants are in different stages of growth, 1200 plants are three years old, and are producing a fine crop of large bold berries; 5000 trees are two years old, and are in a very healthy and flourishing condition. These also are producing berries, and are doing remarkably well when taking into consideration that a crop is not expected much before three years; 9000 plants were planted out last year, and 36,000 during the present year.

About 1000 of *Coffea arabica* are planted out, and these have produced good crops of berries of good size.

Cacao is also being grown; 4500 plants have been planted out, and their appearance is everything that could be desired for young plants.

Rubber-trees.—Ceara rubber (*Manihot Glaziovii*) are also being cultivated; 700 trees have been planted out, and are doing exceedingly well; a few plants of *Ficus elastica* have made considerable growth.

Fruits.—Pine apples, the cultivated forms of this fruit are grown to a small extent, and produce fruit of good size and flavour.

The work of the plantation is being carried out systematically; good roads cut, shelter belts left, and planting and hoeing being attended to and carried out properly. The ground is kept free from weeds as much as possible.

Nurseries.—Seedling plants of coffee in beds number about 10,000; large nurseries are being made ready for the reception of seeds for

supplying plants to further extend the plantations. Mr. Punch hopes to raise in all about 50,000 plants.

The plantations are worked at the present time by about 70 Kroo and native labourers.

Judging from the healthy appearance of the plants, and their development since they have been planted out, the soil must be everything that could be desired, and well suited to the cultivation of coffee and other plants.

The work is very creditable to Mr. Punch, who takes great interest in it. He was pleased to see me to obtain information on many points.

I next visited the plantations, the property of A. C. Campbell & Co., situated on the other side of the river, and about one hour distant from the town of Ajilete. I visited this plantation in the early part of 1893, and reported on it. At that time preparations were being made for planting out during the rains. I could see a marked improvement since my first visit, and considerable work had been done.

Mr. Campbell offered me every facility, and was pleased to see me visiting the plantation. He states that he has 160 acres under cultivation, most of these being planted with Liberian Coffee, numbering 67,000 plants. They are represented in three stages of growth:—13,000 were planted out in 1893, and are in a most flourishing condition; the berries are well matured, and of good size. In 1894, 22,000 were planted out and are doing well; while 32,000 have been planted in their permanent place during the present year. The plants are looking very satisfactory for the time of year.

Here, also, are a few plants of *Coffea arabica*. They have done so well that Mr. Campbell intends to extend the plantation and plant more of this kind.

Nurseries.—About 25,000 plants of *Coffea liberica* are in beds large enough to transplant.

Vanilla (*Vanilla planifolia*).—These were obtained from the Botanic Station, and grown in a shady and cool place on the plantation. Here they have made enormous growth, and have been doing so well that Mr. Campbell anticipates planting out an acre with this valuable plant.

Kola (*Cola acuminata*).—About 600 of these have been planted under the shade of forest trees.

Cacao.—About 300 plants of cacao have also been planted out, to ascertain their suitability for further cultivation.

The plantation is kept in a clean condition, free from weeds; the soil is rich in vegetable matter; it is pure forest land, and several streams pass through the plantation, which are very useful in watering the nurseries.

The work has progressed considerably since my previous visit, and the work carried out by Mr. Campbell is very creditable indeed. This plantation is worked by 45 labourers.

Insects.—To a small extent these exist on both plantations. The borer is the most destructive, but there are very few plants attacked by it. On its first appearance it should be at once got rid of. Mealy bug and scale attack some of the trees, and a peculiar caterpillar at a certain season of the year devours the leaves.

H. Millen, Curator,
Botanic Station.

DX.—BOTANICAL ENTERPRISE IN EAST AFRICA.

As pointed out in the *Kew Bulletin* for 1893, p. 363, numerous notices have appeared in these pages recording the attempts made by means of the Botanic Station system to develop the material progress of the West African colonies.

So far, however, it has not been formally applied to the British possessions on the East Coast. The transmission of tropical plants suitable for cultivation in those territories is not unattended with difficulty, and a convenient station on the coast, where they could be propagated, and from which they could be drawn, would undoubtedly be of great utility to intending planters both in British East and in British Central Africa.

As regards the latter territory, Mr. Alexander Whyte, acting under the instructions of Sir Henry Johnston, K.C.B., H.M. Commissioner and Consul-General, commenced a small botanical garden in 1891 at Zomba, the head-quarters of the administration. An account of the enterprise is given in the *Kew Bulletin* for 1895 (pp. 186–191). The site is, however, some 400 miles from the coast, and plants transmitted from England can only reach it by the Zambezi. There is every reason, however, to believe that the Shiré Highlands will become the seat of an important planting industry. Coffee was introduced as long ago as 1878. It has been cultivated with great success by the Messrs. Buchanan, and 30 estates "have been opened up." Shiré Highland coffee commands a high price on the London market.

The first attempt to establish a depôt on the East Coast was due to private initiative.

As stated in the *Kew Bulletin*, 1892, p. 87, "during the time Sir John Kirk, G.C.M.G., K.C.B., was Agent and Consul-General at Zanzibar, he maintained at his own expense an experimental garden in which he tried every useful tropical plant likely to be adapted to the climate. These were for the most part supplied from Kew."

Apart from this he took, from his first residence in the country, an enthusiastic interest in the botany of Tropical East Africa, and his collections of specimens of its little-known vegetation are amongst the most important available for the "*Flora of Tropical Africa*" in preparation at Kew.

He was not less interested in promoting industries that have since proved of the utmost value both to the natives and to Europeans in that part of the world.

The utility of work of this kind fortunately does not cease with the removal of the hand that carried it on. The benefits that are still derived from Sir John Kirk's garden in Zanzibar are illustrated by the following passage in Mr. Alexander Whyte's *Report* on Botanical Work in British Central Africa, lately published by the Foreign Office, and already cited in the *Kew Bulletin* (1895, p. 187).

"During the short stay of Mr. Johnston's expedition at Zanzibar in June 1891, Captain Sclater and I visited Sir John Kirk's old garden, a short way out of town, which is now a station of the Universities Mission. Through the kind courtesy of the lady missionaries I procured the seeds of a good many economic and ornamental plants from the garden, such as Liberian coffee, *Casuarina*, cassias, guavas, anonas, passifloras, mango, orange, cucurbitaceous plants, pineapple shoots, &c., and nearly all of them are now doing well at Zomba. I also brought with me a supply of ripe cacao pods from the same garden or plantation, which plant had

been introduced years ago by Sir John Kirk. The seeds from these pods, I regret very much to say, failed to germinate."

A fuller account of the present condition of the garden is contained in the following notes of a recent visit, taken from the *Zanzibar Gazette* of the 28th August 1894:—

"Mr. Crabbe, the Ceylon planter who was passing through here last week on his way to Nyassaland, paid a special visit to Mbweni for the purpose of noting the condition of the coffee plantations started by Sir John Kirk at the close of his time here.

"Mr. Crabbe was well pleased with the condition of many of the trees, and as the crop was ripe and falling, he opened some berries and considered some of the beans quite fine. He made several recommendations, which were duly transmitted to the Rev. J. Key, who takes great interest in the plantation, but who was unfortunately away from home at the time.

"The tea which is now in full blossom and affords a pretty sight well worth a drive to visit, Mr. Crabbe considered a poor kind and for the leaf hardly worth growing, and he did not recommend its extension.

"The cacao he considered planted in too windy a site, but walking about the shamba pointed out many spots on which he thought it could be planted to better advantage."

In the *Zanzibar Gazette* of the 11th September 1895, there is an appreciative review of Sir John Kirk's work in East Africa. His services to botany and horticulture are referred to as follows:—

"Besides these main features of his rule, minor affairs of the island were his constant solicitude. Agriculture, horticulture, experimental planting, the rearing of botanical specimens, all engaged his attention.

"The specimens of imported plants still to be seen in his old shamba at Mbweni, full of interest to the interested visitor who is lucky enough to find them, show how keen was his enthusiasm for the adornment of the place, while his efforts to establish a profitable occupation for the natives in connection with coffee planting, and aloe fibre manufacture may even yet bear fruit. Hardly is there a flower displayed upon a dinner table in Zanzibar which does not owe its introduction into the island to Sir John Kirk; and had he remained here, with all the opportunities the place affords, Zanzibar might now be a floral and arboreal Paradise; as it is, his memory will be kept ever green in this way alone."

In a private letter, dated October 16, 1895, Sir John Kirk wrote:— "My garden at Mbweni is coming at last to be appreciated, and after eighteen years my coffee plantation, which supplied me with coffee when there, is now likely to be the source of an industry to relieve the dependence on the clove which is the danger of the island. My coffees all came from Kew; they are Liberian and do splendidly."

Almost every economic production of East Africa has at one time or another received attention from Sir John Kirk. He virtually created the rubber trade of the east coast. This has attained in some years to a value of over 200,000*l.* The plants yielding the rubber discovered by him are enumerated in the *Kew Report* for 1880 (pp. 39 to 42).

Again, plants of the East African copal, *Trachylobium hornemannianum*, were received from him, as well as specimens of the Bark cloth of Uganda (*Kew Bulletin*, 1892, p. 58); Kew is also indebted to him for

seeds and particulars of two new species of African plantains (*Musa livingstoniana* and *M. proboscidea*), as recorded in the *Kew Bulletin* (1894, p. 225).

A kind of dye-wood (*Cardiogyne africana*, Bur.), probably of economic value, was described by Sir J. Kirk (*Journal of the Linnean Society*, ix., p. 229) as the produce of a new species of *Cudrania*. The edible fruit "has somewhat the flavour of an insipid custard-apple. The tree ranges at least from the Zanzibar coast to British Central Africa, where it is apparently abundant. Bentham and Hooker (*Genera Plantarum*, iii., p. 362) refer it to *Plecospermum*; but now that the fruit is known to consist of free drupelets, it is better, perhaps, to give it generic rank.

Sir John Kirk's services to horticulture at home cover the whole period of his residence in Africa. The following list of plants introduced by him to European gardens, chiefly through Kew, is an interesting record of what is possible to be done by an enthusiastic and devoted traveller:—

PLANTS introduced from EAST TROPICAL AFRICA to KEW by Sir JOHN KIRK.

Aloe brachystachys, Baker, n. s.p. Bot. Mag. t. 7309.
 ,, *concinna*, Baker, n. sp.
 ,, *Kirkii*, Baker, n. sp.; Bot. Mag. t. 7386.
 ,, *penduliflora*, Baker, n. sp.
Chlorophytum Kirkii, Baker, n. sp.; Gard. Chron. 1882, (i.) 103.
Clerodendron cephalanthum, Oliver, n. sp.; Ic. Pl. t. 1557.
Crinum Hildebrandtii, Vatke.; Bot. Mag. t. 6709.
 ,, *Kirkii*, Baker, n. sp.; Bot. Mag. t. 6512.
Drimiopsis Kirkii, Baker, n. sp.; Bot. Mag. t. 6276.
Encephalartos Hildebrandtii, A. Br.
Hibiscus schizopetalus, Hook. f, n. sp.; Bot. Mag. t. 6524.
Impatiens Sultani, Hook. f., n. sp.; Bot. Mag. t. 6643.
Kæmpferia (*Cienkowskya*), *Kirkii*, n. sp.; Bot. Mag. t. 5994.
Keramanthus Kirkii, Hook. f., n. gen.; Bot. Mag. t. 6271.
Landolphia florida, Benth.; Bot. Mag. t. 6963.
 ,, *Kirkii*, Dyer, n. sp.
 ,, *petersiana*, Dyer, n. sp.
 ,, *Watsoni*, Dyer, n. sp.
Musa livingstoniana, Kirk, n. sp.; Journ. Linn. Soc. ix. 128.
 ,, *proboscidea*, Oliver, n. sp.; Ic. Pl. t. 1777.
Neobenthamia gracilis, Rolfe, n. gen.; Bot. Mag. t. 7221.
Ochna Kirkii, Oliver, n. sp.
Sansevieria Kirkii, Baker. n. sp.; Bot. Mag. t. 7357.

Every effort has been made by Kew to assist the establishment of planting industries in British Central Africa by the despatch of plants suitable for cultivation there. But owing to the length of time occupied by the transit, the operation is beset with considerable difficulty.

The following letter gives an account of the measure of success which attended the last consignment:—

MR. J. W. MOIR to ROYAL GARDENS, KEW.

Lauderdale,
British Central Africa, *via* Chinde,
20th September 1895.

MY DEAR SIR,

THE Wardian case you kindly sent me per s.s. Illovo on 26th June last arrived here yesterday, having been 85 days *en route*. This was full 20 days longer than it should have been, and I have written very strongly to the agent of the African Lakes Company at Chinde, pointing out that while healthy passengers can take care of and speak for themselves, healthy plants want and demand by their inability to shout out for themselves more care and attention.

In spite of the long transit, they are in marvellously good condition. Only four are absolutely dead and non-existent, a hole only remaining to testify visually to their former existence. These are all Musas. Then *Cinnamomum Camphora* and *C. zeylanicum* seem quite dead; while *Dipteryx odorata*, *Eugenia malaccensis*, *Piper longum*, and Tamarind, have only vague signs of life. *Eugenia Jambos*, *Passiflora maliformis*, *Piper Cubeba*, and *P. nigrum* will come round I hope and trust, while all the other 20 are in good condition. This seems a marvellous result after 85 days, a period seldom exceeded, I should think, in these days of rapid transit. Twenty good, four fair, four doubtful, and six dead: excellent!

All the Musas being dead remind me that I have been on the look-out since reading your *Bulletin* on bananas, for seed of our indigenous Musa here But it is difficult to get, and seems to seed very seldom. When I get seed I shall send you some.

As to the material of the panes, which is much better than the old glass, the varnish or oil had melted and a good many leaves had stuck to it and been quite spoilt. It had run down the branches and stems of three or four, and apparently killed them so far. The moment I got off the first side, or front, I put sheets of paper over each pane to prevent this. Perhaps for hot journeys paper or some such impervious covering would be of advantage.

I gave the plants perhaps 10 minutes diffused light in a verandah, about 2 p.m., when they arrived, and over an hour again later in the afternoon. To-day I have taken them into a room, with both slopes off, taking out six or eight that seemed suffering from too much moisture. To-morrow I shall have them put into boxes and carefully turned twice or thrice a day, first in the room, next in the verandah, and lastly in a shady place in the open air. Those that are moribund I shall give a little bottom heat.

Hoping many may eventually prove of much use in the country, and with my sincerest thanks,

I remain, &c.,
(Signed) JOHN W. MOIR.

W. T. Thiselton-Dyer, Esq., C.M.G., C.I.E.,
Director, Royal Gardens, Kew.

Before the establishment of the Botanic Garden at Zomba, numerous Wardian cases of plants were sent to the African Lakes Company and

the Livingstonia Mission. The following is a list of plants which have been so despatched during the last ten years :—

Botanical Name.	English Name.	Destination.	Date.
Adenanthera pavonina	Red sandal wood	A.L.C.	1886
Alpinia Galanga	Siamese ginger	,,	,,
Anona muricata	Sour sop	,,	,,
,, ,,	,, ,,	L.M.	1894
Bertholletia excelsa	Brazil nut	A.L.C.	1886
,, ,,	,, ,,	L.M.	1894
Bixa Orellana	Arnatto	A.L.C.	1886
Camellia Thea	Assam tea	,,	,,
,, ,,	,, ,,	L.M.	1894
Carica candamarcensis	-	,,	,,
Caryophyllus aromaticus	Clove	A.L.C.	1886
,, ,,	,,	L.M.	1894
Cedrela odorata	West Indian cedar	,,	,,
Chrysophyllum Cainito	Star apple	,,	,,
Cinchona ledgeriana	Cinchona	A.L.C.	1886
Cinnamomum Camphora	Camphor	,,	,,
,, Cassia	Cassia	,,	,,
,, ,,	,,	L.M.	1894
,, zeylanicum	Cinnamon	,,	,,
Coffea arabica	Arabian coffee	A.L.C.	1886
,, ,, var.	Maragogipe ,,	,,	,,
,, liberica	Liberian ,,	,,	,,
Cola acuminata	Kola nut	L.M.	1894
Cratæva gynandra	-	A.L.C.	1886
Cyphomandra betacea	Tomato tree	L.M.	1894
Dipteryx odorata	Tonquin bean	A.L.C.	1886
Epipremnum mirabile	Tonga	,,	,,
Erythroxylon Coca	Coca	,,	,,
,, ,,	,,	L.M.	1894
,, ,,	,,	A.L.C.	1886
Guiacum officinale	Lignum vitæ	,,	,,
Gynocardia odorata	-	,,	,,
Hevea spruceana	Guiana rubber	,,	,,
Inocarpus edulis	-	,,	,,
Jambosa vulgaris	Malay apple	,,	,,
Limonia acidissima	-	,,	,,
Manihot Glaziovii	Ceara rubber	,,	,,
Musa Champa	Plantain	L.M.	1894
,, martabanica	,,	,,	,,
Nephelium Litchi	Litchi	A.L.C.	1886
Passiflora edulis	Sweet cup	L.M.	1894
Pilocarpus pinnatifolius	Jaborandi	,,	,,
Pimenta officinalis	Allspice	A.L.C.	1886
,, ,,	,,	L.M.	1894
Piper Cubeba	Cubeb	,,	,,
,, longum	Long-pepper	,,	,,
,, nigrum	Pepper	,,	,,
,, ,,	,,	A.L.C.	1886
Psidium Guayava	Guava	,,	,,
Swietenia Mahagoni	Mahogany	,,	,,
Tamarindus indicus	Tamarind	,,	,,
,, ,,	,,	L.M.	1894
Theobroma Cacao	Cocoa	A.L.C.	1892
,, ,, "Alligator"	,,	L.M.	1894
,, ,, "Nicaraguan"	,,	,,	,,
Vanilla grandiflora	Vanilla	,,	,,
Xanthochymus pictorius	-	A.L.C.	1886
Zingiber officinale	Ginger	,,	,,

During the course of last year a prolonged correspondence took place between Kew, the Foreign Office, and Sir Henry Johnston, with a view of ascertaining if some depôt could be established on the east coast from which plants could be supplied to Nyasaland and which would be of more easy access than Zomba. The idea, however, proved impracticable, and Zomba will therefore for the future be treated as the central station to which plants will be sent, where they can be propagated and from which they can be distributed.

The whole position is thoroughly discussed in the following letter from Sir John Kirk :—

Sir JOHN KIRK to ROYAL GARDENS, KEW.

Wavertree, Sevenoaks,
November 30, 1895.

DEAR THISELTON-DYER,

YOU ask me regarding the establishment of stations for the distribution of useful plants in East Africa. It is obviously a needless expense and waste of means for Kew and other horticultural establishments in England to send out separate consignments to each separate district as hitherto has been done. The work of receiving plants for distribution in East Africa should in my opinion be limited to two central stations, where once received they would be propagated or forwarded at once in part by a skilled gardener who would examine each case on arrival.

The districts to be considered are (1) the British Protectorate of Nyasaland and the British territory south of the Zambesi to be administered by the South Africa Company.

Clearly the best route by which to transmit cases of plants for this region is *viâ* the Cape, as a rule, and Natal with its existing garden is the best centre, being in regular communication by the Cape steamers and possessing a sub-tropical climate where plants likely to succeed in the Nyasa highlands could readily be propagated for distribution.

There is one obstacle that presents itself in the way of this proposal, namely, the rules that are found to be necessary in order to keep the coffee leaf disease out of the Nyasa coffee plantations.

If, therefore, Nyasa will not allow plants that have been propagated at Natal or other points on the coast to be introduced, the administration must make its own provision for the direct transmission of cases and abandon all participation in such a scheme as you suggest. As Nyasaland is in a prosperous state the Administration, aided by the planters, will no doubt prefer to incur the additional cost of direct consignment, in which case there is no necessity to consider the use of Natal as a centre, but if a coast station is to be established to supply that part of our possessions, I feel satisfied that Natal is the proper place from its commercial position and the facility of access and distribution coupled with the warm and moist climate it possesses.

(2.) Between Nyasa and Zanzibar we have no interest, and as at Zanzibar and on the opposite mainland at Mombasa the climate is tropical, a separate station is there needed. Natal would not serve as a centre, partly from the distance, the want of rapid communication and the nature of the climate, that of Natal being sub-tropical and not fitted for many of the plants that might thrive near the equator.

The best point for a central garden to serve the Zanzibar and inland regions would be a little inland from the port of Mombasa, which is a port of regular call by steamships. At a distance of from 10 to 15 miles inland at the foot of the coast hills, or to the south in the Shiruba hills a suitable site with rich soil and abundant water could be found.

The further advantage of such a position is that it would be at the base of a railway line, the construction of which is only a question of a short time if we intend to hold our protectorate in Uganda.

Something might be said for making the station on the island of Zanzibar, where I had my experimental garden, but the climate and soil of the island do not suit many plants that might well be introduced. I would, therefore, prefer a mainland station as near to Mombasa and the railway base of the future as may be.

You are free to make any use you please of the above.

Yours sincerely,
(Signed) JOHN KIRK.

No step has yet been taken to establish a depôt for British East Africa. Meantime, Sir John Kirk's garden still continues to do useful service.

EXTRACT from the GAZETTE for ZANZIBAR and EAST AFRICA, November 27, 1895.

The Rev. Père Mérel only last week, on behalf of the Fathers of the Holy Ghost, took away with him a large quantity of berries for planting at their Mission station of Bura in the Taita district, these being kindly supplied by Miss Thackeray from her specimen plants at Mbweni, planted by Sir John Kirk.

This has brought coffee planting to our doors. We hope from time to time to publish intelligence helpful in these matters.

In a private letter, dated December 15, 1895, Sir John Kirk writes in regard to his Zanzibar garden, which he transferred to Miss Thackeray of the Universities Mission :—"It is a great satisfaction to know that the results have not been thrown away, but are even at this late date beginning to bear fruit. The Germans have long well appreciated the store of fruit trees and flowers, cuttings and seeds of which were to be had, and the tropical species of *Eucalyptus*, such as *E. citriodora*, that I grew are now common from seed obtained from my trees."

DXI.—MYRRH AND BDELLIUM.

Myrrh and frankincense have been precious commodities from the earliest times. Few drugs have had more careful study bestowed on their origin. Yet even to this day it is by no means free from uncertainty.

The preparation of a new edition of the *Official Guide* (*No.* 1) *to the Museums of Economic Botany* in the Royal Gardens has necessitated a re-examination of the subject in view of the fresh observations of Dr. Schweinfurth, of which a brief account is given in the *Pharmaceutical Journal* (April 28, 1894, p. 897).

Flückiger and *Hanbury* (*Pharmacogr.*, 2nd ed., p. 140) state: "It is certain . . . that the myrrh of commerce is chiefly of African origin."

But numerous other myrrh-like substances are found in Eastern trade which are used as substitutes, and are often intermixed with it. The source of these is partly African, partly Arabian, and partly Indian. But to trace this in each case is a task fraught with extreme difficulty.

AFRICAN MYRRH.

According to Hanbury (*Pharmaceutical Journal*, xii., p. 227), "*Somali* or *African Myrrh* is the so-called *Turkey Myrrh* of commerce."

Of this drug Flückiger and Hanbury (*Pharmacogr.*, 2nd ed., 143), give the following description: "Myrrh consists of irregular roundish masses, varying in size . . . of an opaque reddish brown with dusty dull surface. When broken, they exhibit a rough or waxy fracture, having a moist or unctuous appearance, especially when pressed, and a rich brown hue. The fractured translucent surface often displays characteristic whitish marks, which the ancients compared to the light mark at the base of the finger nails. Myrrh has a peculiar and agreeable fragrance, with an aromatic, bitter and acrid taste."

Somali myrrh is collected "on the range of hills which on the African shore runs parallel to the Somali coast" (*Flück.* and *Hanb.*, *l.c.*, p. 140). The identity of the plant producing it has been carefully studied by Dr. Trimen.

He makes the following statement (*Pharmaceutical Journal*, 3rd ser., ix., p. 893): Hildebrandt "collected in March 1873 in the Ahl Mountains, which run parallel with the North Somali coast" a plant which "was pointed out to him by the natives, who call it *Didin*." He "found myrrh exuded on the stem of the tree, of which the specimen gathered was a branch; it exudes spontaneously, without any external injury, and is called *Molmol* by the Somali, but *Mur* by the Arabs; the former collect it in great quantity, and it is brought to Aden and other Arabian ports, whence it is carried to India and Europe."

This plant Hildebrandt referred without doubt to *Balsamodendron Myrrha*, Nees (*Sitz. Ges. Naturf. Fr.*, Nov. 1878, p. 196).

Dr. Trimen further says: "A large branch sent over in a living state to Kew by Mr. Wykeham Perry appears to be identical with Hildebrandt's . . . It was obtained in Somali-land near the parallel of 47° E. long. Mr. Perry gives the Somali names as *Didthin* for the plant, and *Mulmul* for the product." (*l.c.*) An account of this specimen is given in the *Kew Report* for 1878 (p. 40).

Dr. Trimen had not merely the advantage of discussing the subject with Hildebrandt himself, but he examined and figured (*Bentley* and *Trimen*, *Medicinal Plants*, t. 60) the Somali plant collected by the latter. He further had the opportunity of comparing it with the specimens collected by Ehrenberg on the Arabian coast of the Red Sea (opposite Massowa) on which *Balsamodendron Myrrha* was founded.

So far, then, nothing would seem more secure than the determination of the source of Somali myrrh. Flückiger and Hanbury (*l.c.* 141) conclude: "*Balsamodendron Myrrha*, Nees . . . must therefore be pointed out as the source of true myrrh of the European commerce."

Unfortunately the recent researches of the Berlin botanists have thrown serious doubt on this. It seems clear that the plant collected by Hildebrandt and figured by Trimen is not *B. Myrrha.* On the other hand, it is not, as the Berlin botanists have supposed, *B. Playfairii*, a plant which produces Gum Hotai, a substance entirely different to myrrh. It is apparently closely allied to *Balsamodendron* (Commiphora) *Schimperi*, which must therefore provisionally be accepted as the source of African Myrrh.

Arabian Myrrh.

There appear to be at least two, and probably more, kinds of *Arabian myrrh.*

i. According to Flückiger and Hanbury (*l.c.* p. 143), "Myrrh trees abound on the hills . . . in the territory of the Fadhli tribe . . lying to the eastward of Aden; myrrh is collected from them by Somalis who cross from the opposite coast for the purpose, and pay a tribute for

the privilege to the Arabs. But a sample of it received . . . from Vaughan in 1852 . . . proved it to be somewhat different from typical myrrh." According to the same authorities (*l.c.* p. 146) both *Somali myrrh* and *Fadhli myrrh* give a violet tint when bromine is added to a petroleum solution.

Hanbury (*Pharmaceutical Journal*, xii. p. 227) thus describes the specimen obtained by Vaughan "produced 40 miles to the eastward of Aden":—"In irregular pieces, varying in size . . . not coated with dust like pieces of *Turkey myrrh*, but having a somewhat shining exterior. Each larger piece appears to be formed by the cohesion of a number of small, rounded, somewhat transparent, externally shining, tears or drops. The fracture much resembles that of common myrrh, but wants the semicircular whitish markings. In odour and taste it closely agrees with true myrrh. Portions of a semi-transparent, brown, papyraceous bark are occasionally attached to pieces of it."

ii. What may be called *Hadramaut myrrh* appears to be distinct from the above. Dymock (*Pharmaceutical Journal*, 3rd ser. vi. 661) says:—"From Makulla and Aden another kind of myrrh is received, the *Arabian myrrh* of the Pharmacographia. The trade name of this drug in Bombay is *meetiga;* it is mostly sold in India as true myrrh, for which it might easily be mistaken . . . I am assured by the dealers that no true myrrh is ever received from Arabia." And the same statement is quoted from Malcolmson by Royle (*Materia Medica*, 2nd ed. p. 384):—"There is no myrrh produced in Arabia."

Parker (*Pharmaceutical Journal*, 3rd. ser., x. p. 81), however, says:—"The '*meetiga*' of the Bombay market, called Arabian myrrh by Dymock, differs entirely from . . . Hanbury's *Arabian myrrh*." But Flückiger and Hanbury only recognise under the name Nos. i. and iii.

iii. Flückiger and Hanbury (*l.c.* p. 146) describe what is apparently a third kind of Arabian myrrh. "This is the myrrh '*Hodaidia Jebeli*,' from north and north-western Yemen." It gives no colour with bromine.

The source of these kinds of myrrh is still involved in more or less uncertainty. *Balsamodendron Myrrha* was originally described from Ehrenberg's Arabian specimens. It is doubtful if it affords any part of the Arabian myrrh of commerce. This conclusion is confirmed by Deflers, *Voyage au Yemen* (p. 120).

"Le myrrhe,—el-Mour des Arabes,—est, après le café, un des principaux articles de commerce du Yemen. Mais elle y est importée en grande partie du Harrar et des pays Sômalis qui sont les véritables centres de production de cette résine aromatique. Bien que l'arbre à myrrhe (probablement le *B. Myrrha*) soit commun dans toute la région montagneuse moyenne et inférieure du Yemen, il est trop disséminé dans les localités que j'ai visitées pour être l'objet d'une exploitation rémunératrice."

Balsamodendron Opobalsamum, Kth. (B. ehrenbergianum, *Berg.*) appears to be widely distributed throughout the Arabian littoral. It has been repeatedly collected in the neighbourhood of Aden. Deflers refers to this species, though with hesitation, the plant from which myrrh is collected in Northern Yemen. He remarks that it had neither flower nor fruit and seemed to belong to a form intermediate between *B. Myrrha* and *B. Opobalsamum.* He gives the following account of the collection of myrrh from it (*l.c.* p. 121).

"La myrrhe en larmes, concrété à la surface des fragments d'écorce pris sur les *Balsamodendron* des environs de Hodjeilah m'a paru abondante et comparable aux variétés les plus estimées. Déjà, sur les

contreforts du gebel Hofasch, au N. du wadi Surdûd, on commence à pratiquer l'extraction de la myrrhe. Mais c'est principalement dans le district de Sùda, à environ 90 kilom. au N.N.E. de San'â, que cette industrie est exercée en grand. Le procédé d'extraction est forte simple. Il consiste en incisions longitudinales pratiquées dans l'écorce. La myrrhe est recueillie dans des tasses (findjân) disposées au bas des incisions."

The most recent research on the subject is that of Schweinfurth already referred to. He has been so kind as to furnish the following abstract of his results. It must be premised that *Balsamodendron*, *Hemprichia*, and *Commiphora* are all names for the same genus.

RÉSULTATS de mes recherches sur le Baume et la Myrrhe.

A.—*À l'égard des recherches bibliques:—*

Le mot hébraïque "*mór*" n'est pas à traduire avec myrrhe, mais par "baume."

"*Mór*" est toujours cité dans le sens d'un liquide aromatique, tandisque que la myrrhe est un corps solide, pas ou presque pas aromatique, mais à l'émploi de la médecine, plutôt d'une odeur désagréable.

Tous les passages de l'ancien testament ne mentionnent ce "*môr*" que dans le sens indiqué (Cantiques 3, 6; 5, 1; 5, 5; 5, 13; Moïse II., 30, 23; Psaumes 45, 9; Proverbes Salom. 7, 17).

Les LXX (juifs précisés) en traduisant le texte hébreux en grec, n'ont plus connu, à l'époque où ils vivaient, la vraie signification du "*môr*," mot qu'ils ont par ressemblance du son confondu avec le mot arabe *morr*, que veut dire "myrrhe."

Les traducteurs allemands récents de .Hallé de l'ancien testament qui ont collaboré à l'édition de Hallé 1894 de Prof. Kautsch ont adhéré à l'opinion que je viens de prononcer. Le Prof. Kautsch m'a promis de changer tous les passages (cités ci-devant) de l'ancien testament d'après mes constatations.

L'arbre de baume est appelé en Arabic *bechâm* (anglais *beshâm*). Ce nom est connu aussi de Ibn-el-Baitar.

Le produit de baume est appelé *balessân*, d'où les Grecs on tiré leur *βάλσαμον*. En hébreux (voir Cantiques 5, 1; "mori-im-besâmi") bechâm se prononcait bĕsĕm ou basām.

B.—*À l'égard de la nomenclature botanique.*

Baume est le suc de *Commiphora Opobalsamum*.

La myrrhe est la résine de *Commiphora abyssinica*, et très-probablement aussi de *C. Schimperi*.

Nees de Esenbeck a commis l'erreur de substituer à la Myrrhe une autre espèce le *Hemprichia* (Commiphora) *Myrrha*, (Nees) Schwf., parcequ'il avait mal copié une note dans l'herbier d'Ehrenberg qui indiquait pour cette plante: "fortasse etiam Myrrham prœbens, sed non satis constat." Malgré cette note la plante fut proclamé dans les Düsseldorfer Arzneigewächse, tab. 357, comme le prototype de la myrrhe.

Il faut cependant conserver par droit d'ancienneté le mot mal appliqué de Nees *Hemiprichia Myrrha*. Cette plante que le compagnon d'Ehrenberg, le Dr. Hemprich avait cueilli en 1825 près de Lahaja, appartient au Tehama, la région littorale du Yemen, tandis que la vraie Myrrhe ne pousse que dans les montagnes, soit de l'Arabie soit de l'Abyssinie. Le *H. Myrrha*, Schwf., est complètement inodore et ne produit aucune résine.

MM. Engler, Schumann, Garcke, &c , ont adopté dans leur édition l'explication donnée par moi. La myrrhe des Somal n'est pas encore suffisamment constaté, personne n'a vu la recueillir, sauf Hildebrandt qui a manqué d'identifier l'espèce botaniquement. Chez les Somal plusieurs espèces de *Commiphora* sont en jeu.

L'identité de *Commiphora abyssinica* avec la myrrhe du commerce d'Arabie a été constaté par M. A. Deflers en 1893 dans le pays des Fadhli (est d'Aden) ou il a vu collectionner la myrrhe et d'oú il a rapporté des échantillons botaniques. D'après Deflers aussi la region à l'ouest d'Aden, au centre de l'angle sud-ouest qui forme la peninsule d'Arabie, en contient beaucoup. Cette espèce de myrrhe est aussi beaucoup exploité dans le district de Suda dans le Yemen turc (90 kilomètres à nord-ouest de Sana). Ce dernier donne la myrrhe du commerce exporté par Hadeidah comme la meilleure.

La myrrhe n'est pas recueillie en Abyssinie du moins pas pour le commerce.

En Arabie on appelle la myrrhe aujourd'hui "*Khaddash*" pour le produit, "murr" ou "morr" serait plutot l'expression arabe littéraire.

La myrrhe des anciens était un medicament solide; une seule variété, qu'on appelait "*stakte*" pouvait servir comme ingrédient aromatique à la composition des mixtures odorantes.

The deliberate judgment of so accomplished a botanist as Dr. Schweinfurth is entitled to great weight. It will be observed that he expresses no opinion as to the origin of *Somali myrrh*, although he sets aside the conclusions which have hitherto been drawn by Flückiger, Hanbury, Trimen and others from Hildebrandt's observations The conclusions at which Schweinfurth arrives are apparently: (i.) that *Fahdli* and *Yemen Myrrh* are identical; (ii.) that both are produced by *Balsamodendron abyssinicum* with which Deflers appears to have recently identified the plant which he formerly doubtfully referred to *B. Opobalsamum*.

I must confess that both conclusions seem to me to present some difficulty. In the first place both Somali and Fadhli myrrh give the same colour reaction with bromine, while Yemen myrrh gives none. Yet Hanbury (*Pharm. Journ.* xii., p. 227) thought Fadhli myrrh "the produce of some other tree than that producing common myrrh," *i.e.*, that the plants producing Somali and Fahdli myrrh were different, as is probably the case. On the other hand, the Kew Herbarium contains a specimen from the neighbourhood of Aden collected by Captain Hunter and labelled by him "true myrrh," which agrees with *B. Myrrha*. In the *Kew Report* for 1878 (p. 40) the following account is given of a specimen sent to Kew by Mr. Wykeham Perry "as the true myrrh tree of Arabia." "It came from the hills in the Fadhli district, some 60 miles from Aden. It was believed to be the same species as the Somali plant. This may be so, but it is wanting in the excessive spininess of *B. Myrrha*, and a small flowering branch previously received from Mr. Wykeham Perry appeared to agree with *B. Opobalsamum*, Kth., found in Abyssinia by Schweinfurth, and which is believed to be identical with *B. ehrenbergianum*, Berg." Trimen (*Bentley and Trimen, Medicinal Plants*, sub tab. 60) on the other hand regards the specimen as belonging to "apparently the same species" as *B. Myrrha*. It seems probable that Wykeham Perry's plant is the same as the intermediate form of Deflers referred to above, and I am now disposed to identify it with *Commiphora simplicifolia*, Schw.

The Kew Herbarium contains a suite of specimens of this species, collected in Arabia Felix by Schweinfurth himself. Two of these bear the vernacular name "*Chaddasch*" or "*Chaddesch*." I presume that this is the plant identified as *B. abyssinicum* by Deflers. The identity of Schweinfurth's with the Abyssinian plant is not obvious, and it may conveniently be maintained as a distinct species. Schweinfurth remarks that myrrh is not collected from *B. abyssinicum* in Abyssinia, and the only evidence that I have seen that it yields any product of the sort is the label of a specimen collected by Speke and Grant, which bears the remark "Frankincense shrub, fencing by gardens."

A specimen of a plant stated to yield myrrh collected by Captain Hunter in the neighbourhood of Aden seems to me also identical with Schweinfurth's. The evidence appears to point to the conclusion that in the Fadhli district myrrh may be yielded by both *Balsamodendron Myrrha* and *B. simplicifolium*, while the latter may be accepted as the source of *Yemen myrrh*.

As to *Hadramaut myrrh*, we have the evidence of the specimens collected in 1893–4 by Mr. Theodore Bent, who was asked to give particular attention to the subject. It can hardly be doubted that they are referable to *B. Opobalsamum* (*Kew Bulletin*, 1894, p. 330).

African Bdellium.

This drug, which is associated with myrrh, but, as far as East Africa is concerned, seems little known in European commerce, is exported to Bombay from Berbera, a small seaport in Eastern Africa, viâ Aden. It appears to have been generally identified with the drug to which Guibourt originally gave the name, and which was derived from West Africa.

Royle (*Mat. Med.*, 2nd ed., 387) says:—*Balsamodendron africanum*, Arnott "found in the west of Africa, occurs also in Abyssinia, having been found in the flat country of the Adel. It yields African bdellium, or that imported into France from Guinea and Senegal, according to M. Perottet. M. Adanson, likewise, in his travels in the Senegal, mentions it by the name of *Niotout*, as producing bdellium."

Guibourt (*Hist. Nat. des drogues simples*, 4e ed. iii., 472) says that "il en vient aussi d'Arabie qui parait être de même nature." With regard to *Balsamodendron africanum*, the plant producing it, he adds "il est probable qu'il traverse l'Afrique de part en part, et rien n'empêche de penser qu'il ne croisse également en Arabie."

Dymock (*Pharmacogr. Ind.* i., p. 310) says:—"to a certain extent resembles myrrh, but is of a darker colour, less oily, and has a peculiar odour destitute of the aroma of myrrh;" and further "common bdellium is strongly bitter and has hardly any aroma."

The most detailed description is, however, given by Parker (*Pharm. Journ.*, 3rd ser. x., p. 82):—"*African Bdellium* is met with in large tears like *Opaque Bdellium*, but the granulation is less coarse, and the surface is traversed by deep cracks. It is very hard; the conchoidal fracture appears slightly opaque, of a dull bluish stony hue, with a characteristic resinous margin; it is reddish and *translucent* in thin layers, almost odourless, and its taste feebly bitter."

Dymock (*l. c* p. 310) includes both this and *Habak-hadee*, a drug to be described further on, under the general name of "*Bysa-bol.*" This is, however, used by all other writers in a more restricted sense.

The following passage in Royle's Materia Medica (pp. 386–7) seems to have been overlooked by later writers.

"Mr. Johnston, also in his travels through Adel to Abyssinia (i. p. 247), in treating 'of the tree that yields this useful drug, myrrh,' says 'there are in the country of Adel two varieties, one a low, thorny, ragged looking tree, with bright green leaves, trifoliate, and an undulating edge, is that which has been described by Ehrenberg. This produces the finest kind of myrrh in our shops.' This may be either *B. Myrrha* or one of the forms of *B. Opobalsamum*. 'The other is a more leafy tree, if I may use the expression, and its appearance reminded me exceedingly of the common hawthorn of home, having the same largely serrated, dark green leaves, growing in bunches of four or five, springing by several leaf-stalks from a common centre. The flowers are small, of a light green colour, hanging in pairs beneath the leaves, and in size and shape resemble very much the flowers of our gooseberry tree. . . . . . The fruit is a kind of berry, that when ripe easily throws off the dry shell in two pieces, and the two seeds it contains escape. The outer bark is thin, transparent, and easily detached; the inner, thick, woody. When wounded, a yellow turbid fluid (the gum-myrrh) immediately makes its appearance. Naturally, the gum exudes from cracks in the bark of the trunk near the root, and flows freely upon the stones immediately underneath. Artificially it is obtained by bruises made with stones.'

"This plant, judging from the specimens deposited by Mr. Johnston in the British Museum, corresponds exactly with one, also in the same collection, obtained by Mr. Salt in Abyssinia, *Balsamodendron Kua* of Mr. Brown's MSS., and of which Mr. Salt says, he obtained from it a gum much resembling the myrrh."

I am indebted to Mr. George Murray, the keeper of the Botanical Department of the British Museum, for tracings both of Mr. Salt's drawing and of Mr. Johnston's specimen. Both appear to me referable to *B. abyssinicum*, which Oliver refers as a variety to *B. africanum*. Royle states (*l.c.*, p. 387, footnote):—"Mr. Johnston immediately recognised it [*i.e. B. africanum*] as one of the trees yielding gum resin. The leaflets are like those of *B. Kua*, Br." It appears therefore that of the two plants met with by Mr. Johnston, the first is the source of "true myrrh," the second of African bdellium.

Opaque Bdellium.

Parker (*Pharmaceutical Journal*, 3rd. ser. x., p. 82) gives the following description of this drug:—"may be at once recognised by its *opaque*, yellow-ochre coloured, conchoidal fracture; it resists the nail. It is very hard and difficult to fracture (difference from "gum hotai"), almost odourless and its taste bitter without acidity, occurs frequently in large elliptical tears with a coarsely granular surface."

Like African bdellium, it finds its way to India from Berbera.

According to Dymock (*Pharmaceutical Journal*, 3rd ser., vi., p. 661) this is found in the bales of African myrrh when sorted at Bombay. It "is called *meena harma*, and is used for the extraction of Guinea worm; it is of a yellowish-white colour, resembling ammoniacum, with hardly any odour, and a bitter taste."

Parker however (*l.c.*, p. 82), remarks that "Dymock's specimen . . . of *Opaque Bdellium*, is *a very brittle* opaque gum, which agrees chemically with the gum *hotai* of Vaughan. Dymock's identification would seem therefore to be incorrect. Perhaps Parker's statement was

not clearly understood by Bentley and Trimen who (*Medicinal Plants*, sub tab. 60), referring to *Hotai*, observe "for which *Opaque Bdellium* is another name."

Parker (*Pharmaceutical Journal*, 3rd ser. xi., p. 41), further points out that tincture of *Opaque Bdellium* gives an intense greenish-black colour with ferric chloride, while tincture of *gum hotai* does not.

Of the source of *Opaque Bdellium* nothing appears to be known. Parker (*l.c.* p. 82) attributes it to *Balsamodendron Playfairii*, supposed to be the source of *Gum Hotai*, but there appears to be no ground for this except Bentley and Trimen's mistaken identification of the two drugs.

Bissa Bôl.

Hanbury states (*Pharmaceutical Journal*, xii., p. 227) that this is "usually regarded as a species of myrrh of inferior quality. It was formerly known as *East Indian Myrrh*, but is now seldom so distinguished . . . . It is quite distinct from *Indian* and *African Bdellium*."

Flückiger and Hanbury (*Pharmacographia*, 2nd ed., p. 146.) says:—"*Bissa Bôl* differs from myrrh in its stronger almost acrid taste, and in odour which when once familiar is easily recognisable; fine specimens of the former have the outward character of myrrh, and perhaps are often passed off for it." But they state that, unlike myrrh, it gives no violet colour with bromine.

They identify it with *Habaghadi* or *Hebbakhade* of the Somalis.

It is exported from the whole Somali coast. (*Flück. and Hanb. Pharmacographia*, 2nd ed., p. 145.) According to Captain Hunter (quoted by the same authors, *l.c.*, pp. 140, 141) it is not found "in the coast range of the Somali country, but only at a considerable distance from the sea-shore."

He gives the following description of it: "occurs in irregular-shaped pieces more or less flat, some of them having earth and fragments of bark adhering; it is of a dark reddish-brown colour, but opaque reddish-white streaks run through the semi-transparent reddish mass. The odour is more powerful and more perfumed than that of bdellium; the taste perfumed, aromatic, and feebly bitter."

Dymock (*Pharmaceutical Journal*, 3rd ser. vi. p. 661) further says that the adherent bark is thick, "not the birch-like bark that adheres to common bdellium . . . The odour on fresh fracture is powerful and pleasant, not unlike a lemon lollipop."

Parker (*Pharmaceutical Journal*, 3rd ser. x., p. 82) identifies Dymock's *perfumed Bdellium* with *Bissa bôl* proper. He states that "bales of *Bissa bôl* are shipped from Berbera to Bombay; probably a large proportion of it goes to China."

He describes it as resembling "myrrh much more closely than either of the bdelliums previously described. In external appearance it is very similar, the fracture is waxy, yields to the nail, giving an oily exudation like 'soft myrrh'; yellowish-white markings also appear, which however differ essentially from those of myrrh in being traversed by angular interstices filled with transparent reddish-brown resin (or gum resin). It may be readily distinguished by its powerful aromatic odour, totally unlike myrrh, difficult to describe (perhaps because nothing resembles it), but easily recognised after one introduction to the olfactory nerve. . . . . . . The taste is aromatic and slightly bitter."

In the *Kew Reports* for 1878 (p. 41) and 1880 (pp. 50, 51) reference is made to specimens of the plants yielding Bêsabol brought to this country by Mr. Wykeham Perry. They produced foliage at Kew and were identified as *Hemprichia erythræa*, Ehr. *Hemprichia* is now known to be identical with *Balsamodendron*, and the species producing *Bissà bôl* may therefore be regarded as *B. erythræum*. Parker (*l.c.*) gives it as *B. Kafal*. This is apparently founded upon the remark of Bentley and Trimen (*Medicinal Plants*, sub tab. 60) that *Hemprichia erythræa* is probably to be referred to *Amyris Kafal* of Forskål. In this Engler (*De Cand. Monogr.* iv. p. 21) agrees.

Trimen (*l.c.*) also suggests the further identity of *Balsamodendron Kataf*; but in this Engler (*l.c.*, p. 19) does not concur.

Mr. E. M. Holmes made the following statement (Pharm. Journ., 3rd Ser., XXV., 1894–95, p. 501) :—

"With regard to the perfume called opopanax, I find that the oil of opopanax of perfumery is obtained from a gum-resin which has a totally different origin, being derived from *Commiphora Kataf*, Engl. It is the "Bissabol" of Pharmacographia (2nd Ed., p. 145), and the perfumed bdellium of Dymock, Mat. Med. India, pp. 158–9. In appearance it resembles opopanax and myrrh also, but it has a slightly pleasant and quite distinctive odour."

It is pointed out in the *Kew Report* for 1878 (p. 41) that :—"Forskal relates that the gum of *Balsamodendron Kataf* is used by Arab women for washing their hair, which is precisely the purpose for which that next to be mentioned [*Gum Hotai*] is employed in Somali-land."

Hotai.

According to Vaughan (*Pharm. Journ.* xii., p. 227) this "is the name of a gum produced by a small thorny tree which grows in the Somali country about Bunder Murayeh. The tree or shrub is in appearance not unlike that which produces the myrrh, and attains the height of about six feet."

Flückiger and Hanbury (*Pharmacogr.* 2nd. ed., p. 146) quote Miles for the statement that "*hodthai* is only used in the Somali country, by men to whiten their shields (by means of an emulsion made with the drug), by women to cleanse their hair." They further suggest that "probably *hodthai* and *habaghadi* is one and the same thing." In the *Kew Report* for 1880, p. 51, it is pointed out that "the gums themselves are certainly distinct, and . . . . . . the plants yielding them also."

The origin of *Hotai* seemed clearly established by the specimens sent to Kew by Sir Lambert Playfair which Sir Joseph Hooker described as *Balsamodendron Playfairii*. To these is attached in the Kew Herbarium a note by Hanbury :—"It constitutes a spiny shrub of 6 feet high growing in great abundance all along the Somali coast on the sandy plain lying between the mountains and the sea. Its Arabic name *Hotai* is also applied to the gum which it appears to produce in abundance and of which Captain Playfair has sent us specimens. This gum is an opaque, whitish, brittle substance, occurring in large tears; it is nearly inodorous but has bitterish acrid taste; with water it readily forms a frothing emulsion. The gum is collected by the Somalis, who use it as soap, and according to Mr. Vaughan especially for cleansing the hair."

Hanbury (*Pharm. Journ.*, xii., pp. 227, 228) describes Hotai (from Vaughan's specimens) as occurring in "irregular pieces . . . .

of wax-like opacity, cracked in all directions, and readily breaking up into angular pieces; on the exterior the larger pieces are yellowish-brown or somewhat liver-coloured, and occasionally encrusted on one side with a reddish sand . . . internally paler or nearly white, sometimes darker towards the centre. . . . . Nearly inodorous, but in taste is slightly bitter and acrid to the throat . . . . . agitated with water in a phial speedily affords an emulsion, which remains frothy and milky for many days."

Engler (*De Cand. Monogr.* iv., p. 11), has identified *B. Playfairii* with *B. Myrrha*, but this identification cannot be sustained.

Playfair's specimens bear the label "Somali country. The plant yielding the gum 'Hotai.'" This Engler quotes as "Somali, in campis Hotai," a translation which might, perhaps, mislead. It is, however, to be noted that the myrrh plant grows on the mountains parallel to the Somali coast, while Playfair's plant grew on the sandy plain between the mountains and the sea.

Engler (*Natürl. Pflanzenfam.* iii. 4, p. 256) quotes the statement of Hildebrandt which has been cited above as to the plant from which the latter collected myrrh in Somali-land. But he adds the qualification not given by Trimen that it was a plant "much resembling *B. Myrrha*, which has been described as a distinct species, *B. Playfairii.* This is, however, an error; as shown above, it is different from both.

Casual Ingredients.

African myrrh when sorted at Bombay is found to contain a variety of other substances more or less similar in character. About these little or nothing is known. They are discussed by Parker (*Pharm. Journ.*, 3rd ser. x., p. 82, and xi., pp. 41–43).

Indian Bdellium.

Two kinds are described by Dymock (*Pharmacogr. Ind.* i. pp. 31 0 311).

i. The produce of *Balsamodendron Mukul* somewhat resembles the African drug in general appearance, the pieces often having portions of papery bark attached to them, but the colour is lighter, often greenish; the odour and taste are somewhat different, and a certain proportion of it is in distinct vermiform pieces as thick as the little finger. Its value is one-third less than that of African bdellium.

ii. The produce of *B. Roxburghii* occurs in irregular lumps covered more or less with dirt and hair, to which portions of papery bark as well as the thick inner bark sometimes adhere; it is of a greenish-yellow colour, with an occasional tinge of red; consistence waxy, soft and brittle; odour peculiar and balsamic, something like cedar wood; taste bitter; with water it forms a greyish-white emulsion.

It seems not impossible that these are the same thing, and produced by the same species, *B Mukul.* Stocks erroneously identified *B. Mukul* with *B. Roxburghii*, which is an eastern and not a western species in India (*see* Hooker, *Kew Journ. Bot.*, i., p. 259).

DXII.—MISCELLANEOUS NOTES.

Mr. Robert Derry, formerly in the employ of the Royal Gardens, and late Assistant Superintendent of the Gardens and Forest Department, Malacca, a post recently abolished, has been appointed Superintendent of Gardens, Perak.

Mr. Alfred Parsons, Superintendent of the Annandale Gardens, Simla, Punjab, has resigned his appointment on the reduction of the salary. The post has ceased to be filled by an officer possessed of technical knowledge.

Mr. Charles Wakely has been appointed Staff Instructor in Horticulture under the Technical Instruction Committee of the Essex County Council. He was for five years in the employ of the Royal Gardens, during two and a half years of which he was sub-foreman in the tropical propagating department.

Mr. William Binder, late foreman in the Temperate House Department of the Royal Gardens, died at Kew on January 12 last after a prolonged illness. His service extended from 1871 to 1887, when he was retired on account of old age. The Superannuation Act of 1887 abolished pensions for men in Mr. Binder's position, and on his retirement he only received a small gratuity. His case was, however, taken up by the Gardeners' Benevolent Institution, from which Mr. Binder received an annual allowance until his death.

The Botanical Magazine for February.—*Begonia umbraculifera*, a native of Brazil, is a robust species, remarkable for having hermaphrodite and unisexual flowers intermixed. Kew obtained a plant from Messrs. Sander and Co., who imported it with orchids. "*Scutellaria formosana*" is a pretty, half-shrubby species having dark purple flowers. It was sent to Kew by Mr. Ford, the Superintendent of the Botanic and Afforestation Department of Hong Kong, with the information that it was from the island of Hainan. But the plant figured is not the true *S. formosana*, N.E. Br. but *S. javanica*, Jungh., though it is probable that the former, *S. javanica*, and *S. sumatrana* are varieties of one species. *Sternbergia macrantha* is a handsome species received from Mr. E. J. Whittall, of Smyrna. *Hechtia argentea* (Bromeliaceæ) was drawn from a plant that has been in the collection for at least a quarter of a century. It is the most attractive of this striking but not very showy genus. *Bifrenaria tyrianthina*, a fine Brazilian species, is an even older inhabitant of our gardens, having been introduced by the firm of Loddiges 60 years ago. The plant figured was obtained from Messrs. Linden, of Ghent, in 1893.

Relief House.—One of the great difficulties in maintaining a collection of plants under glass is the necessity from time to time of repairing and

repainting the houses in which they are grown. For this purpose the houses have to be emptied and the plants removed. They inevitably suffer severely from being crowded and stowed away in places quite unsuitable to their cultivation.

To remedy this difficulty, H.M. Office of Works built last year in one of the private cultural departments of the establishment ('Melon Yard') a "relief house." This structure is 56 ft. long, 23 ft. wide, and 13 ft. 7 in. in height at the ridge. It is constructed of iron, and in order to admit as much light as possible, copper glazing by Messrs. Rendle was adopted for the lights. Any collection can now be transferred at short notice to the "relief house" where it will be, though not accessible to the public, safe from injury till its original quarters are again available for occupation.

Palm House Heating.—During the past year the renewal of the heating apparatus in the Palm House has been completed. In the *Kew Bulletin* (pp. 42, 43) for February 1895 an account was given of the work done on the north wing in 1894 at a cost of 1,000*l*. During the past summer the south wing has been dealt with in the same way.

It is now becoming generally understood that the heating of large structures for horticultural purposes requires a different treatment to that which is suitable in other cases. It is necessary to have a large amount of piping heated to a comparatively low temperature rather than a small amount at a much higher. At first sight this looks wasteful, but in practice it does not prove to be so. The improvement of the heating arrangements in the Palm House have resulted in a considerable economy of fuel, though there are more pipes to heat. An insufficient amount of pipes necessitates the furnaces being "driven," with a consequent waste of fuel. The atmosphere in the house is heated by the continuous movement of the hot air in contact with the pipes, which in turn is replaced by cooler ("convection"). The hotter the pipes, the more violent are the currents and draughts set up. The heated air absorbs the moisture too rapidly, to deposit it as "drip" on the cold surface of the glass. In cold weather it is almost impossible to maintain the humidity necessary for the welfare of the plants. These, especially when tropical, suffer almost more from excessive dryness than from a low temperature.

As the heated air ascends from the pipes below it cools, and a down draught is set up. The use of a high level auxiliary pipe to a large extent remedies this. Piping is now carried round the whole of the Palm-House at the level of the lantern.

Douglas Spruce Spar.—The great flagstaff in the Arboretum at Kew is one of the most conspicuous landmarks of the neighbourhood. It is the second of two spars which were presented to the Royal Gardens with great public spirit by Edward Stamp, Esq., of the firm of Messrs. Anderson, Anderson, and Co. The first was from British Columbia, and was 118 feet in length. It was broken in course of erection in 1859. The existing spar came from Vancouver's Island, and is 159 feet in length. It was erected in 1861, and is believed to be the tallest spar in the old world. The age of the tree from which it was cut was about 250 years, and its total height 180 feet. The base had gradually become decayed, and on examination it was pronounced by the Admiralty to be unsafe. Messrs. Anderson, Anderson, and Co. were

however, of opinion that it might still be preserved, and on their recommendation the work was placed by H.M. Office of Works in the hands of Messrs. Robinson and Dodd, contractors to H.M. Indian Government, of Bridge Road Works, Poplar. They successfully lowered it, removed the decayed base, and spliced on a new one of pitch-pine. The splice is held together by five iron bands. The spar was then re-erected on February 4 last.

Pelican.—During the month of January the fine Dalmatian pelican (*Pelicanus crispus*), which had for many years been a popular pet in the Royal Gardens, met with some unexplained accident, and broke both its wings. The injury was, unfortunately, not discovered till it was past remedy, and the bird had to be killed to put it out of suffering. It was given to the Royal Gardens in 1888 by Lord Lilford, who had obtained it from the Lower Danube.

The Zoological Society has, with great kindness (through the secretary, P. Sclater, Esq., F.R.S.), supplied its place with a female white pelican (*Pelicanus onocrotalus*), which it is hoped will mate with the surviving bird of the same species.

Blackthorn fishhooks.—Amongst recent additions to the Museums is one illustrating a singular application of the blackthorn (*Prunus spinosa*). It seems that the spines or thorns of this well-known plant are not uncommonly used on the east coast of Essex as fishhooks. We are indebted to Mr. R. T. Pritchett, a resident of Kew, for a portion of a fishing line that has apparently seen considerable service on the Essex coast, and to which these thorns with a small portion of the twig attached are fixed by a peculiar knot to the short lines. In the volume on "Sea Fishing," forming one of the Badminton Library series, these singular hooks are illustrated, and are thus referred to :—"In the Thames estuary, on the coast of Essex, thorn hooks are still used. The form of these curious contrivances, which we should expect to find among aborigines rather than in English waters, will be understood from the illustration. Each thorn has about an inch of lugworm twisted round it, and the lines so baited are laid about 50 yards from the shore at low tide." In addition to the actual specimen Mr. Pritchett has been good enough to furnish a drawing of the hook showing the attachment to the line, and he further tells us that similar hooks were, a few years since, used on the coast of Merioneth.

Strobilanthes callosus.—This is an acanthaceous plant confined to western and central India which has not hitherto had any economic properties attributed to it, nor does its distinct patchouli odour seem to have been recorded. The following correspondence gives the particulars :—

Mr. F. C. Constable to Royal Gardens, Kew.

Dear Sir, Rhandalla, January 3, 1896.

I send you a box of the apparently unopened buds of a shrub or small tree. I send them for this reason : I was walking on a steep mountain side through half a mile or more of these trees close together

simply laden with the buds. There was in the air a sweet, resinous, pleasant odour from the buds. My hands were covered with what they exuded and—this is the point—though I washed my hands three times the pleasant scent remained.

Can the buds be put to any use? I am here but for ten days, but from what I have seen should think there must be an almost inexhaustible supply.

Yours faithfully,
(Signed) F. C. Constable.
Karachi, Sind.

Messrs. Piesse & Lubin to Royal Gardens, Kew.

2, New Bond Street, London,
February 4, 1896.

Dear Mr. Jackson,

Your note and the sample of Strobilanthes duly to hand this morning.

The odour certainly somewhat resembles patchouli, but, we think here, not so good.

If your correspondent could have some of the cones and leaves distilled with water so as to collect the otto we could form a better opinion as to its applicability to the wants of the perfumery trade. Speaking generally, we think it would be likely to be used in the soap trade. Some ottos, as you know, are considerably altered by the distillation, for example neroli, from orange blossom, and the neroli is perhaps more appreciated than the orange blossom, if we may judge from the everlasting demand for "eau de cologne" in which it is prominent. The experiment is worth trying, and perhaps your correspondent would pick up some hints from the "Art of Perfumery."

Believe me, &c.,
(Signed) Charles H. Piesse.

Mr. Littledale's Tibetan Plants.—Mr. Littledale gave a striking account of his recent remarkable journey in Tibet at the meeting of the Royal Geographical Society on February 24.

The Director made the following remarks on the plants collected :—

"It was a happy circumstance that Mr. Littledale had been able to save his parcel of dried plants from the disasters which befel the rest of his collections. Its examination, which is not yet wholly completed, proved extremely interesting. It contained between 60 and 70 species, of which probably ten are new to science. They were nearly all found in a [Gooring] valley (about 16,000 feet) on the south side of the high range of mountains which lie between the Tengri Nor and Lhasa. The precise position was lat. 30° 12′, N. and long. 90° 25′, E.

"One of the most striking features of the collection is the large preponderance of European genera; one might in fact say of British, because the large majority are represented in Britain. Out of betwen 40 and 50 genera there are only half a dozen of which this is not the case. Five species, *Aconitum Napellus*, *Potentilla fruticosa*, *Myriophyllum verticillatum* *Taraxacum palustre* and *Polygonum viviparum* are actually found in this country. The first is probably an introduced plant, the *Myriophyllum* is an aquatic, the distribution of which is usually wide, but the two last are characteristic mountain forms with us. And

in *Potentilla fruticosa* we have the most striking link between the two floras, as, though a rare plant, it is undoubtedly native in the North of England and the West of Ireland.

"The flora of Western Tibet has long been tolerably well known. Eastern Tibet on the other hand was stated by Sir Joseph Hooker in 1855 to be 'quite unknown botanically.' Since this time our knowledge of the northern belt is the result of the journies of Prjevalsky and Potanin, of Captain Bower, and of Mr. Rockhill. The publication of the collections of the two former travellers was interrupted by the lamented death of Maximowicz. Those of the two latter were worked out at Kew, and the results are published in the *Journ. Linn. Soc.* (vol. xxx., pp. 131–140). Of the flora of the country between the neighbourhood of the Tengri Nor and Sikkim our knowledge is still extremely limited, and is much enlarged by Mr. Littledale's work. Sir Joseph Hooker in two days' journey only succeeded in collecting some 15 to 20 species. In 1882 the Royal Botanic Gardens, Calcutta, obtained some plants through a native collector, Ugyen Gyatsho, who accompanied Sarat Chandra Das in his journey to Lhasa; the collector did not, however, get further east than Gyatse Jong. In 1890, Prince Henri d'Orleans, like Mr. Littledale, attempted to reach Lhasa from the north, but apparently collected no plants in this part of his journey.

"The conditions under which the Tibetan flora exists are perhaps unique. Long ago General Strachey expressed his conviction that flowering plants existed up to 19,000 ft. (J.R.G.S. xxi., p. 77). But 18,000 ft. appears to have been the highest observed level till the receipt of the collections of Surgeon-Captain Thorold who accompanied Captain Bower. The conditions under which vegetation can exist in such circumstances are of course extreme. It is hardly necessary to say that there are no trees and no shrubs nor any plants above a foot high. Very few indeed are above 3 inches out of the ground. General Strachey estimated that in the part of Western Tibet which he visited 'not one twentieth part of the surface was covered with vegetation' (*Journ. Linn. Soc.* xxx., p. 101). A very large proportion of the plants are herbaceous perennials with long tap-roots, a rosette of leaves lying on the ground, from the centre of which springs the dwarf inflorescence.

"The flora as a whole belongs to the Arctic-alpine division of the great northern region. But as usual this contains a purely endemic element, and also one related to the neighbouring area to the south, from which it has been perhaps recruited. Of the characteristically Tibetan plants obtained by Mr. Littledale some had been previously obtained by Prjevalsky, Thorold, and Rockhill. Of the species not exclusively Tibetan, some extend to the Himalayas and the mountains of Western China.

"Of the typical Arctic-alpine flora two species may be singled out as representative. *Lychnis apetala* extends to Spitzbergen, and there is a very interesting form of the well-known edelweiss, *Leontopodium alpinum*, which was also collected by Mr. Rockhill. The total absence of gentians in Mr. Littledale's collection is remarkable. It is interesting to note that the single fern collected, *Polypodium hastatum*, was previously only known from Eastern Asia (China, Japan, and Corea). Among the new species is a striking grass. Of two fungi collected, one is new."

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

Nos. 113–114.] MAY and JUNE. [1896.

DXIII.—BOTANICAL ENTERPRISE IN BRITISH HONDURAS.

A botanic station was established in the neighbourhood of Belize, in British Honduras, by the Governor, Sir Alfred Moloney, K.C.M.G., in 1892 (*Kew Bulletin*, 1895, p. 10). The first curator was Mr. James McNair, who, under the supervision of the same energetic Governor, had laid the foundation of the successful station now existing at Lagos in West Africa.

Sir Alfred Moloney has recently issued a "Brief Outline of the Botanical Efforts of the Government of British Honduras." This gives an interesting account of the work of the station and of the part it is intended to play in aiding the economic development of the colony. Hitherto British Honduras has been largely dependent upon the cutting of mahogany and logwood. The former has, however, seriously declined of late years owing to the competition of so-called "mahogany" from West Africa. It is evident that other industries are necessary for the welfare of the colony, and the Governor has rightly drawn public attention to the means which appear to him to be most conducive to that end. If we trace the course of development of such colonies as Jamaica and Ceylon it is evident that the cultural industries must at the present time be selected with great judgment and care, having regard to the conditions of soil and climate, to the circumstances of local labour, and the opportunities offered for disposing of the produce. British Honduras is very favourably situated as regards soil and climate, and it has excellent communication with the Southern States of America. The Governor's efforts therefore deserve warm support from the general community, and there is little doubt that as soon as the rich lands in the interior of the colony are opened by the proposed railway considerable development will take place in the cultivation of coffee, cacao, fruit, and other tropical staples. The following extracts are taken from the Governor's statement:—

In 1882 the question of establishing in Belize or in some other part of the Colony a Botanic Station was put forward by Sir Joseph Hooker, K.C.S.I., C.B., then director of the Royal Gardens, Kew, for the consideration of the Colonial Office.

Although in 1884 the recommendation reached the stage of adoption by the Secretary of State for the Colonies, the scheme only took shape in September 1892.

The necessity for such an institution had been long recognised in the Colony in furtherance of the development of its cultural industries. In recognition of this want, and in deference to the popular feeling, I took advantage of the opening of the Legislative Council, on the 29th March 1892, to invite the intelligent interest and financial support of that body in the direction desired.

* * * * * *

It has become part of the general Colonial policy to encourage the production of varied staple articles of export of a more or less permanent character. In such a direction, more especially in agriculture, much has been done by the active interest and assistance of the authorities of the Royal Gardens at Kew to develop new industries, and to distribute plants of commercial importance. In furtherance of such views, there have been established in all our West Indian Possessions, Botanic Stations. Surely the time has come for a similar institution in a Colony which has such exceptional advantages, whether we look to climate, soil, or a market. It has been with some justice advanced that British Honduras can be made the Tropical Garden of North America.

* * * * * *

The products of our cultural industries, still really in their infancy, are chiefly represented by bananas, plantains, cocoanuts, coir, coffee, henequen, Indian corn, limes, mangoes, oranges sour and sweet, pineapples, avocado pears, rubber, to which there should be added, in time, arnatto, cacao, ground-nut, indigo, jute, ramie, spices, manila, and doubtless other marketable commodities.

* * * * * *

There resulted the unanimous acceptance and passing by the Legislature of an Ordinance No. 1 of 1892, to provide for the establishment of a Botanic Station.

This Ordinance empowered the Governor-in-Council to make from time to time Rules:—

(1.) For the management, government, and control of the station, and of the officers appointed in connexion therewith.

(2.) For the distribution of plants therefrom.

(3.) Generally for encouraging and promoting the use and efficiency of the Botanic Station as a means of education in all matters appertaining to agriculture and horticulture.

Provision of 1300 dollars, made up of 300 dollars for a gardener and 1000 dollars for the maintenance of the grounds of Government House, had been previously made in the annual Estimates under 'Governor and Councils.'

In 1892 that provision was supplemented by 1000 dollars, and the aggregate credited to the Surveyor-General's Department under the new heading 'Botanic Centre.'

The following is the Report of the Committee appointed to recommend a suitable site for the establishment of the Central Botanic Station:—

"Belize, 29th December 1893.

SIR,

THE committee appointed to decide on the most suitable site for a botanic station have the honour to report:—

1. Having considered the various sites proposed they are in favour of the one offered by the British Honduras Syndicate at Hope Creek, in the Stann Creek district.
2. The committee having in view the probable extension of the agricultural development of the colony, which is likely to take place, by the creation of convenient stations, from which economic plants can be readily obtained, would respectfully suggest that the offer of Messrs. Price Brothers to grant 25 acres of land, in fee, at Kendal, on the Sittee River, be also accepted as an auxiliary station to the one at Hope Creek.
3. The committee would beg further to suggest that about 50 acres of Crown land, in the vicinity of Hope Creek, be reserved for the present, in connexion with the scheme under consideration and pending the results of carrying out their report.

I have, &c.,

J. H. PHILLIPS,

Chairman of the Committee."

The services of a qualified and experienced superintendent in the person of Mr. J. McNair were secured from Jamaica at a salary at the rate of 100*l.* per annum, rising to 130*l.* by an annual increment of 10*l.*, with a house. He arrived on the 9th September 1892, when he assumed the duties of his office as superintendent of the Botanic Station of the Colony, and began his work.

The main object of this initial effort was to establish a distributing centre of economic plants of marketable value, where the wants of small and extensive cultivators could be met.

The site devoted to the purpose was an acre of land appropriated to the use of the public from the grounds of Government House, and which formerly embraced the kitchen garden of the Governor. A suitable cottage in it was appropriated to the use of the superintendent.

It was at the time appreciated that the growing requirements of the colony would necessitate the removal, in time, of the central station to a more suitable site, in one of the rich and protected river valleys, where it could be developed into a general botanic department with a branch as an experimental farm, or in some other form on the chief river of each district.

Steps were accordingly taken to acquire and reserve suitable sites to meet such possible extension.

In such directions the following free grants have been generously made :—

(*a.*) By the British Honduras Syndicate, 75 acres of very fine land, well watered and fairly well provided with shade trees, on Hope Creek, North Stann Creek River, about north of Melinda, which is approached from the sea at Stann Creek by a tram line of some six miles in length, the free use of which is to be allowed to the employés of the station as well as to visitors. This site is also approachable from the sea by the North Stann Creek River.

(*b.*) By E. A. H. Schofield, Esq., 10 acres situated on the San Andres Road, Corosal, and about half a mile from that town ; it is approached from the sea, and has adjacent two rivers, the Hondo and New River, by which plants can be distributed throughout the Corosal and Orange Walk districts.

(*c.*) By Messrs. Price, Brothers, 25 acres at their estate of Kendal, and abutting on the Sittee River, where the waters are abundant and fresh.

(*d.*) By Messrs. Arnold Brothers, 25 acres have also been reserved on the Temash River, in the Toledo District, where the land is of the richest in the colony.

The existing station would remain, and continue to serve as a distributing centre for the Belize and Cayo districts.

The Hope Creek section has been recommended by an able and experienced committee, appointed for the purpose, as the most suitable and convenient site for the general central station of the colony. Sections (*a*), (*b*), and (*c*) have been surveyed, and the two first conveyed to the Government.

It was also considered that the existing station would serve not only as a nursery for the raising and distribution of seedlings, both indigenous and exotic, of economic marketable value, but also might be utilised and resorted to as a practical school for the agricultural education of youths whom planters wish to have trained to serve as gardeners in plantation nurseries, at their own expense as regards lodging and maintenance. So far the hope of the Government in this direction has not been realized. Nor have apprentices been induced to come forward, although applications for them, with the offer of 7.50 dollars (sols) per month have been made in the Government Gazette.

It would be in the interest of the colony to send to Hope Garden, Jamaica, a couple of Creole youths to be trained as gardeners, so that after an apprenticeship of three years they might be able to take charge of sub-stations which would be later established.

In this direction the co-operation of the Government of Jamaica has already been invited.

In support and furtherance of the aim and objects of the Botanic Centre, an Agricultural Society has been established under the provisions of Ordinance No. 23 of 1891, for the purpose of promoting the general interests of the agricultural classes and the industries of the colony.

In the first instance, the society has been constituted by the appointment of a committee of 12 persons, with the Governor as president, and an honorary secretary, representative of the wood, fruit, cane, cacao, coffee, and other economic industries.

The duties undertaken by the committee are :—

(*a.*) To consider all questions affecting the agricultural interests of British Honduras, and to communicate with the Government or otherwise as may seem necessary;

(*b.*) To hold, as may be deemed advisable, agricultural shows and exhibitions of agricultural produce, live stock, machinery, implements, harness, rolling and other dead stock, &c.;

(*c.*) To encourage ploughing, forking, and other labour competitions;

(*d.*) To promote (as the society may deem advisable, and as its funds and powers permit) by means of discussion, prizes, publication of papers, researches and inquiry, reports and application to the Government, and by any other proper and lawful action, the supply, employment, and welfare of agricultural labourers, the collection and publication of statistics, the dissemination of information on all matters relating to agriculture, and the general interests of the agricultural industries of British Honduras.

The necessary legislation (Ordinance No. 24 of 1891) has also been added to the Statute Book against the introduction into the Colony of diseases in plants.

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As a temporary expedient, until it developed sufficiently to stand by itself as a department, the station as regards its staff has been placed

under the Surveyor General, whose officers, scattered as they are over the Colony, would be in a position to further the interests of the Station by contributing from time to time useful plants and seeds.

In the promotion of the distribution in the Colony of *Coffea arabica* and *Coffea liberica*, and other seedlings, the co-operation of the religious denominations and commissioners has been invited, and plants free of cost have been placed at their disposal.

* * * * * *

The Royal Gardens, Kew, and the Botanical Department, Jamaica have been constant and generous in their supply of plants and seeds.

From the report for the quarter ended 31st December 1894, it appears that 1,844 plants are in their permanent places, whilst 9,422 in beds and pots remained available for the public.

The issues have amounted to 25,024, of which 16,829 have been sold and 8,195 given away free.

Amongst these were 19 Nutmeg, 597 Cocoanut, 23,795 Coffee, 49 Cacao, 68 Casuarina, 136 Roses.

* * * * * *

Guided by experience, agriculturists may, I think, accept as products which from a commercial point of view can be profitably grown:—the avocado pear, banana, cacao, coffee (*arabica* for the highlands, *liberica* for the lowlands), cane, rubber (*Castilloa elastica*), cocoanuts, cola nuts, cotton, grape fruit, ground nut, henequen, jute, lemon, lime, nutmeg, pineapple, plantain, pimento, sapodilla (which yields the chewing gum used in the United States), shaddock, tobacco, and vanilla.

As to what are generally called "Kitchen Garden Products" it may be convenient to know that there grow luxuriantly in this Colony the Jerusalem artichoke, asparagus, beans of various kinds, cabbage, carrot, cauliflower, celery, corn, cucumber, edible gourds, Indian kale, lettuce, melon, mint, ochro (widely used in gombo soap in the United States), parsley, potatos (ordinary and sweet), pea, spinach, tomatos.

With such a list as I have mentioned, it seems well-nigh incredible that vegetables have to be imported from New Orleans, some 850 miles away, and that that city is our source of supply instead of being our market.

* * * * * *

The station was opened, as already stated, in September 1892. Quite one-half the area had to be reclaimed and raised 2 feet in some parts. It began to be productive in April 1893.

The experiment has cost the Colony, for 1892–4, \$1,429·40, or £159, a bagatelle compared with the value to the Colony of the economic plants distributed, of the hygienic tree planting that has taken place, and of the practical instruction given by the superintendent.

* * * * * *

The continued fall in the price of mahogany has resulted in closing nearly all the mahogany works. The richer and healthier lands are not sufficiently accessible to permit agriculture being entered upon with success, consequently the Colony finds itself now almost entirely dependent upon one source of wealth, viz., the logwood industry.

The dangers of relying upon one trade are obvious, especially one like logwood, which may at any time be brought to ruin by a chemical discovery in the manufacture of dyes. There is no exaggeration in stating that a collapse in this industry would throw out of employment hundreds, depopulate the Colony, and paralyse its trade and revenue.

Alfred Moloney,
Governor.

DXIV.—SUGAR-CANE DISEASE IN BRITISH GUIANA.

The rind disease due to a fungus, *Trichosphæria sacchari*, which is doing so much damage to the sugar-cane in the West Indies, is discussed in the *Kew Bulletin* for 1895 (pp. 81–88), where references are given to preceding articles.

The following notice taken from the *Demerara Argosy* of November 16 records the existence of the disease in British Guiana, and its probable effect on the crop. It is satisfactory to observe that the systematic burning of the diseased canes is advocated as recommended in the *Kew Bulletin* for 1893 (p. 152). But the further precaution is necessary of taking scrupulous care only to use perfectly healthy canes for propagation, *Kew Bulletin*, 1893 (p. 348).

"Although a few showers have fallen throughout the colony, considerably heavier in some places than in others, the drought cannot yet be said to have ended, and more rain is anxiously awaited. To add to the distress which has hung like a thick cloud over our sugar industry for several years, the rind-fungus has appeared among the canes and is causing a loss of juice that is variously estimated at from 10 to 20 per cent. A leading planter informs us that the quality of the juice is not affected by the fungus, as is the case when canes attacked by the borer are crushed along with good canes; but the quantity is seriously affected, the portion of the cane which the fungus has attacked having nothing left in it but fibre. At the Royal Agricultural Society's meeting on Thursday the question was discussed, and Mr. Howell Jones expressed the opinion that by leaving none of the diseased canes in the field, and burning all the megass from the cane mill, the fungus would be prevented from spreading and soon be eradicated. Athough the disease is said not to affect the quality of the juice, the crushing throughout the colony generally is giving results in saccharine richness somewhat under those of the corresponding period of 1894. But probably the juice will intensify as the season advances; and let us hope that the market will follow suit. At present dark sugar is fetching $2.20 in the street for American refiners, a price which is better than the worst, but far too low to be regarded with satisfaction."

The following letter from the Government analyst gives a valuable account of the extent of the disease and the measures taken for its control:—

Mr. J. B. Harrison to Royal Gardens, Kew.

Government Laboratory, Georgetown,
Demerara, March 3, 1896.

Dear Sir,

Mr. Jenman has shown to me your letter to him concerning the prevalence of rind disease in this colony, and the alleged apathy with which its appearance has been treated by the colonists. From your letter I am inclined to think that you are not in possession of all the facts relative to this matter.

Since the first accounts of the prevalence of this disease in the West Indian Islands reached the colony the keenest interest has been taken in the matter by the planters, and from time to time many of the managers have visited Barbados and inquired into the state of affairs there. It was not, however, until you kindly supplied us with copies of Mr. Massee's paper that we were able to recognise the fungus therein described as one constantly present in the tissues of dead and dying canes in this colony, no matter how their death was caused. From that

time the leading attorneys and managers have kept the closest watch on the canes under their charge in order to detect any outbreak of disease. This first appeared, as far as I am aware, among some seedling canes which had been kept over their ripening period for a special reason (January, 1894). In May and June of that year canes were sent to me from the west coast of Demerara and from the west coast of Essequibo showing unmistakable signs of the disease, whilst later in the year (October and November) canes exhibiting the diseased condition were received by Mr. Jenman and myself in larger numbers and from other localities. In these months it was first noticed to be present to a serious extent in a few fields in West Demerara and West Essequibo. The fields affected were, upon my advice, burnt before cutting, reaped as rapidly as possible and the actually diseased canes destroyed in the combustion chambers of the estates' megass furnaces. The fields worse affected were thrown out of sugar cultivation. In December of 1894 I received instructions to visit the West Indian Islands and to consult with the botanists and chemists who had studied this disease. This I did, and visited Trinidad, St. Vincent, Barbados, and Antigua, as well as Grenada and the island of Carriacou where the cultivation of sugar has been abandoned since 1867. Even in the last-mentioned place I found canes affected with the rind disease. After my return I learned that estates in East Demerara had also suffered slightly from the disease. During the earlier part of last year few cases of its prevalence were brought to our notice, but I received from plantations in Essequibo and Demerara specimens affected with the "root fungus" and also with a peculiar disease causing "clubbing" of the roots. In October and November last it became apparent that large areas of canes were more or less affected in east and west coasts of Demerara, in the Essequibo islands, and on the coast of Essequibo. The estates on the banks of the rivers have not suffered to any extent, whilst the Berbice ones have apparently escaped. At present, canes everywhere seem free from it, but if we suffer from drought I have no doubt it will reappear. As long as we had constant wet seasons the disease remained unnoticed; it is during periods of drought that it occurs. At the Agricultural Committee this disease has been a constant theme of discussion since it first appeared in the islands. I have visited several of the estates where it has been most prevalent, and found that it is practically common only on the front lands of the estates, which have been under continuous cane cultivation for many years, the richer back lands being free from it.

On all estates, as far as I can ascertain, every care has been taken to destroy all diseased canes, and this is far easier to do completely here than in the islands.

I may mention that during my visit to the islands I was forced to the conclusion that the effects due to fungus disease had been greatly exaggerated, as all defects arising from climatic or cultural defects, insect attacks, want of manure and unsuitable soils, had been recently ascribed to the fungus. One manager in St. Vincent informed me that whilst the fungus was injurious to the owners it was a godsend to the managers, as through it they could explain all things which were wrong.

But with regard to this Colony, where the managers of sugar estates are men of an entirely different type to those in the West Indian Islands, I can assure you that there has been no tendency to "pooh pooh" the disease, and that every effort possible is being, and has been, made for its eradication. We have, perhaps, devoted ourselves more to the study of the conditions which have allowed it to spread so rapidly and

to the chemical changes produced by it than to purely theoretical points in connexion with it, and have refrained from allowing ourselves to fall into the state of despondency which characterised several of the West Indian Islands.

I quite agree with your views regarding seedling canes. As far as my observations have gone no variety of cane is immune from the attacks of this fungus, provided that the health of the cane is weakened in any way, and that it suffers from insect attack or other mechanical injury to its tissues.

I remain, &c.
(Signed) J. B. HARRISON.

N.B.—No canes have been introduced into this Colony from Barbados or elsewhere since May or June, 1890. It is not likely, therefore, that the disease has been recently introduced into the Colony.

W. T. Thiselton-Dyer, Esq., C.M.G.

DXV.—HAND-LIST OF CONIFERÆ GROWN IN THE ROYAL GARDENS.

The preface of this publication, which is on sale in the Royal Gardens, is reproduced :—

The present Hand-list might properly have formed part of that of the "Trees and Shrubs grown in the Arboretum," but so many persons possess collections of Conifers who are not interested in other ligneous plants that there was an obvious convenience in treating them separately. There was the further advantage that this enabled the species which are grown under glass to be included. The natural order, or rather group, *Coniferæ*, is so well defined that it is desirable to enumerate in one list all the species actually in cultivation at Kew.

These comprise 227 species, with 340 varieties, belonging to 37 genera.

Sir Joseph Hooker, the late director of the Royal Gardens, had contemplated the preparation of a Catalogue of the Kew Pinetum. In view of it he had drawn up a brief review of the literature of the subject, which he has now, after revision, kindly permitted to be used :—

In the following list the species are referred to the genera under which they have been placed by the latest authorities, who have revised the order *Coniferæ*. That such an authoritative list should be published is the wish of all intelligent cultivators of these interesting plants, and its publication in this country is rendered all the more needful from the fact that the British cultivators alone persist in referring the Silver Firs to *Picea*, and the Spruces to *Abies*, a practice long abandoned on the Continent, and which has not been adopted in America. And if, as I hope, the current nomenclature will in future be adopted in regard to the Latin names of these genera, I would further urge a reform in respect of their English equivalents, in so far as to confine the use of the words Pine to the species of *Pinus*, of Spruce to those of *Picea*, and of Silver Fir to those of *Abies*. We should then be in accordance with the universal practice throughout North America, which is the headquarters of all three genera, where a Pine is never called a Fir, nor a Fir called a Spruce, nor a Spruce a Pine.

The following historic sketch of the various essays of botanists to limit the genera and species of *Abietineæ*, shows how divergent have

been their views. I have endeavoured to make it more instructive, by giving (where there are materials for doing so) under each attempt the number of species known to its author, thus further showing the progressive discovery of species during the last hundred and eighty years or thereabouts.

Tournefort, in 1717, indicated the three genera, *Abies*, *Pinus*, and *Larix* (including *Cedrus*); and his *Cedrus* is *Juniperus*.

Linnæus, in 1753, included these all under *Pinus*, of which he enumerated 10 species.

In 1731 the first edition of *Miller's Gardener's Dictionary* appeared, where he has *Pinus*, *Cedrus*, *Larix*, and *Abies*, with 16 species in all.

In 1789 A. L. de Jussieu, in his *Genera Plantarum*, has only two genera, *Pinus* and *Abies*.

In the same year the first edition of Aiton's *Hortus Kewensis* appeared, wherein all the *Abietineæ* (19 species) are included under *Pinus*.

In 1803 was published the first edition of Lambert's *Genus Pinus*, containing about 35 species of *Abietineæ*, all included under *Pinus*.

In 1813 the second edition of the *Hortus Kewensis* appeared, in which, as before, all the *Abietineæ* (increased to 29) are included under *Pinus*

In 1826 Louis Claude Richard's *Mémoire sur les Conifères* was edited by his son. This classical work is the earliest that dealt scientifically with the order *Coniferæ*, and in it the Tribe *Abietineæ* was first established, to include *Pinus* (under which were placed Spruces and Silver Firs), and *Larix* (which included the cedars), to these were added, *Cunninghamia*, *Agathis* (*Dammara*), and *Araucaria*, which now form a distinct Tribe.

In 1827 Link, in the *Journal of the Academy of Sciences of Berlin*, proposed the five genera: *Pinus*, *Picea* (for Spruces), *Abies* (for Silver Firs), *Larix*, and *Cedrus*.

In 1832 the second edition of Lambert's *Genus Pinus* appeared, wherein the *Abietineæ* were all, as before, included under *Pinus*; which however was broken up by David Don (Lambert's Herbarium keeper) into six sections, *Pinus*, *Strobus*, *Abies* (for the Spruces), *Picea* (for the Silver Firs and Tsugas), *Larix*, and *Cedrus*. About 48 species in all are described.

In 1838 Loudon's great work, the *Arboretum et Fruticetum Britannicum* appeared. The Tribe *Abietineæ* is here adopted as defined by Richard, with the genera *Pinus*, *Abies*, *Picea*, *Larix*, and *Cedrus*: and here that confusion of *Abies* and *Picea* which so distresses British foresters and planters had its origin. At. p. 2105 there is a clavis of the genera, where the genus *Abies* is attributed to Link, but the characters given to it are those of Link's *Picea*; and in like manner *Picea* is attributed to Link, though the characters given are those of Link's *Abies*, and they are followed by *D. Don* in brackets. Turning now to the full account of the genera, at p. 2293, we find "*Abies*, D. Don in Lamb. Pin. vol. iii." with the addition of "*Picea*, Link" as a synonym, followed by descriptions of the Spruces. And at p. 2329 we have "*Picea*, D. Don in Lamb. Pin. vol. iii." with *Abies*, Link, as a synonym; followed by descriptions of the Silver Firs. Now not only was the edition of Lambert's work subsequent to Link's establishment of *Picea* for Spruces and *Abies* for Silver Firs, but Don nowhere in Lambert's *Genus Pinus* proposed these names as generic. Disregarding this blundering, which probably originated in the elaboration of the conifers being a composite work of Don and Loudon working apart,

there remains but one argument for preferring Don's nomenclature, which is, that Linnæus called the Silver Fir *Pinus Picea* and the Spruce *P. Abies*, assuming that he was following the practice of the ancients, in which he is known to have been mistaken.

Owing to the great merit and utility of Loudon's *Arboretum*, his nomenclature has hitherto been universally adopted in the United Kingdom. It contains descriptions of about 70 species of *Abietineæ*.

In 1841 Link (in *Linnæa*, vol. xv., p. 481) reviewed the whole Tribe of *Abietineæ*, retaining, as before, *Pinus*, *Picea*, *Abies*, *Larix*, and *Cedrus*, and enumerating 52 species.

In 1841–46, Antoine's *Die Coniferen* appeared, in which all the *Abietineæ* are referred to *Pinus*, with sections of *Pinus* proper, *Larix*, *Cedrus*, *Picea*, Don, *Abies*, Don, and *Tsuga*; he describes 90 species.

In 1842 Spach, in his *Histoire Naturelle des Végétaux*, adopted *Pinus*, *Abies* (including under it as sections *Picea*, Link, *Tsuga*, and *Pseudotsuga*), *Cedrus*, and *Larix*.

Endlicher, in the same year, in his *Genera Plantarum* reverted to Linnæus' practice of including all under *Pinus*, but made four sections —*Pinus* proper, *Picea*, Link, *Abies*, Link, and *Larix*, including *Cedrus*.

In the same author's *Synopsis Coniferarum*, published two years later, he maintains the genus *Pinus* entire, as before, but subdivides it into 11 sections, with 109 species.

In 1850 Lindley and Gordon published (in the *Journal of the Horticultural Society*, vol. v.) "An enumeration of *Coniferæ* cultivated in Great Britain," where two genera only are adopted, *Pinus* and *Abies*, and the latter is subdivided into Firs (including Spruces), Larches, and Cedars, with 119 species.

Meisner in 1836–43 published his *Genera Plantarum Vascularum*, wherein he includes all *Abietineæ* under *Pinus*, with, as sections, *Pinus* proper, *Picea*, Link, *Abies*, Link, and *Larix*, including *Cedrus*.

In 1855 Carrière's *Traité général des Conifères* appeared; he keeps up *Pinus*, *Abies*, Link, *Picea*, Link, *Larix*, *Cedrus*, and *Tsuga*, which includes *Pseudotsuga*. This work enumerates 133 species, many of which are now ranked as varieties.

In 1858 appeared the first edition of *Gordon's Pinetum*, in which he maintains *Pinus*, *Abies*, Don (including *Tsuga* and *Pseudotsuga*), *Picea*, Don, *Larix*, *Cedrus*, and *Pseudolarix*. He enumerates 131 species, of which many are imperfectly known.

In 1865 Henkel and Hochstetter published their *Die Coniferen*, with the following arrangement, *Pinus*, *Abies* (including *Picea*, Link, *Abies*, Link, *Tsuga*, and *Pseudotsuga*), *Cedrus*, *Larix*, and the new genus *Pseudolarix*, Gord. They describe 130 species, which should be reduced much as Carrière's should be.

In 1867 the second edition of Carrière's *Traité* was published, in which all the genera of the first edition are retained together with *Pseudotsuga* and *Keteleeria*, and 153 species are described, excluding many dubious ones.

In 1868 Parlatore's monograph of the order appeared in the 16th volume of De Candolle's *Prodromus*. The genus *Pinus* is divided into two sub-genera, *Pinus* proper for the Pines, and *Sapinus*; which latter includes as sections only *Picea*, Link, *Abies*, Link, *Cedrus*, *Larix*, *Pseudolarix*, *Tsuga*, and *Pseudotsuga*. The species described are 162.

In 1875 the second edition of Gordon's *Pinetum* was published, in which the same genera are retained as in the 1858 edition, with 150 species.

Lastly, in the *Genera Plantarum* (1882), Mr. Bentham and I have distinguished *Pinus*, *Picea*, Link, *Abies*, Link, *Tsuga*, *Pseudotsuga*, *Larix*, and *Cedrus*, to which must now be added *Pseudolarix* and probably *Keteleeria*, both at that time very imperfectly known.

In 1886 Dr. M. T. Masters published (*Journal of the Linnean Society*, xxii. pp. 169–212, tt. 2–10, with 32 woodcut figures in the text) some "Contributions to the History of certain Conifers." This was followed in 1890 by a "Review of some points in the comparative Morphology, Anatomy, and Life History of the Coniferæ" (*Journ. Linn. Soc.*, xxvii., pp. 226–332, with 29 woodcut figures in the text), and in 1895 by "Notes on the Genera of *Taxaceæ* and *Coniferæ*" (*Journ. Linn. Soc.*, xxx., pp. 1–12).

In 1889, two years after his death, Dr. A. W. Eichler's elaboration of the Coniferæ appeared in Engler and Prantl's *Die Natürlichen Pflanzenfamilien*. He classifies the genera under two primary divisions: *Pinoideæ* and *Taxoideæ*. The former he again divides into *Abietineæ* and *Cupressineæ*, with several ternary divisions, and the latter into *Podocarpeæ* and *Taxeæ*. The genera are limited, with few exceptions, as they are by Bentham and Hooker; but he retains *Chamæcyparis*, *Thuiopsis* and *Pseudolarix*, and sinks *Pseudotsuga* in *Tsuga* and *Prumnopitys* in *Podocarpus*.

In 1891 L. Beissner published a *Handbuch der Nadelholzkunde*. This was preceded by a *Handbuch der Coniferen-Benennung* (1887), followed by two supplements (1891–2) on *Einheitliche Coniferen-Benennung*. Beissner deals critically with the numerous natural and garden varieties and hybrids. He has also paid much attention to nomenclature, though he accepts familiar names rather than revive obscure ones on the rule of priority.

In 1892 the Royal Horticultural Society held a "Conifer Conference," and the papers read thereat form the fourteenth volume of the *Journal* of the Society. This is one of the most interesting volumes issued by the Society, containing a great variety of valuable information concerning *Coniferæ*, including a general introduction and a list of the species cultivated in Great Britain and Ireland, by Dr. M. T. Masters, F.R.S.

In 1894 H. Baillon (*Histoire des Plantes*, xii. pp. 1–45) published an account of the order, with a synopsis of the genera, which he reduced to 24, including *Casuarina*. He divides the order into eight "series," namely: *Taxées*, *Cupressées*, *Junipérées*, *Athrotaxées*, *Nagéiées*, *Araucariées*, *Pinées*, and *Casuarinées*. The inclusion of the last is inexplicable, and some changes in nomenclature will not meet with general approval, *Belis*, Salisb. is revived for *Cunninghamia*, R. Br.; *Podocarpus*, Labill. for *Phyllocladus*, Rich.; *Agathis*, Salisb. for *Dammara*, Lamk., and *Nageia*, Gærtn. for *Podocarpus*, L'Hérit.

Sir Joseph Hooker has been for some years so incessantly occupied with the completion of his "*Flora of British India*" that the detailed study of the Kew Pinetum which, as will be seen, he had proposed to himself, is entirely beyond his powers. Kew has, however, had the advantage, in drawing up the present hand-list, of the assistance of Dr. Masters, F.R.S., who is now the acknowledged authority on the nomenclature of Conifers in this country. As a general rule at Kew, the *Genera Plantarum* is accepted as the standard of nomenclature. In the present case some deviations have been adopted, which have received the concurrence of Sir Joseph Hooker. Of these Dr. Masters has been so good as to furnish the following brief explanation :—

The arrangement of the genera in the following list differs in a few particulars from that adopted in Bentham and Hooker's *Genera Plantarum*. The principal difference consists in the maintenance of the *Taxaceæ* as a distinct order as originally proposed by Richard and followed by Endlicher, Lindley, and many other botanists. This arrangement permits of a more natural arrangement of the several taxaceous genera under two tribes, the *Salisburineæ* comprising *Ginkgo*, *Cephalotaxus*, and *Torreya*, and the *Taxineæ* including the two subtribes *Taxeæ* and *Podocarpeæ*. *Prumnopitys*, Philippi (with which *Stachycarpus*, Van Tieghem, is synonymous) is placed by Bentham and Hooker under *Podocarpus*, but the combination of morphological and histological characters points to the desirability of maintaining it as a separate genus.

Among the *Coniferæ* or *Pinaceæ* proper a few changes have been made from the grouping of Bentham and Hooker in accordance with the fuller knowlege of certain points of structure that is now available. *Tetraclinis* is proposed as a distinct genus, represented by the North African *Callitris quadrivalvis*, on the ground of its structure and geographical distribution. *Widdringtonia* is separated from *Callitris* for similar reasons.

The sub-divisions of *Cupressus* and of *Thuya* have been bandied about between the two genera. The genus *Cupressus*, as here understood, includes the Cypresses proper and the so-called flat Cypresses (*Chamæcyparis*), which Bentham and Hooker place under *Thuya*, and which others prefer to consider as a separate genus. *Retinispora*, it is now well known, has no claim to a separate generic position. The North-western American *Thuiopsis*, placed under *Thuya* by Bentham and Hooker, is more like a *Cupressus*, whilst the Japanese plant, known under the same generic name, is a true *Thuya*. Probably the fusion of *Cupressus* and *Thuya* into one genus would be the most natural arrangement, but in practice the inconvenience of such a grouping and the consequent confusion of the nomenclature would be almost intolerable.

Pseudolarix of Gordon is shown by the male flowers to constitute a distinct genus, as was indeed suspected by Bentham.

Keteleeria of Carrière, referred by Bentham to *Abies*, is also shown by the fuller knowledge we now have of its structure to constitute a distinct genus.

The collections of *Coniferæ* at Kew have occupied three different positions at successive times. According to John Smith's privately printed *Records of Kew* (p. 258), the original Arboretum consisted of about five acres. It lay between the Temple of the Sun and the present Main Entrance. It was laid out by W. Aiton on the Linnean system. "*Pinus* occupied the north and part of the east."

In the first edition of the *Hortus Kewensis* (1789) Aiton enumerates 36 species of *Coniferæ* as cultivated at Kew; in the second edition (1813) 56 species are recorded, "which formed the collection in the original Arboretum." Some of these still remain. According to Smith (p. 286), "within a few yards of the entrance gates on Kew Green stands a specimen of *P. Laricio* (the Corsican Pine). In 1825 the late R. A. Salisbury informed me that he brought it from the south of France in the year 1814; it is now (1880) 85 feet high, and the most conspicuous tree in the Gardens."

Ginkgo biloba (Salisburia adiantifolia), first introduced in 1754, was, according to Smith (p. 267), "originally trained against a wall like a fruit tree; upon the wall being taken down, and the branches cut away,

it is now (1880) a fine tree. When against the wall one of its side branches early produced male flowers." It again did so in 1895, and probably in previous years.

Cedrus Deodara was, according to Smith (p. 287), introduced "by the Hon. Leslie Melville, in the year 1831, who, on visiting the Gardens, gave me a few seeds which he had loose in his pocket, one of which vegetated, and after several years nursing was planted in the old Arboretum. . . . In 1864 it had attained a height of 32 feet." The tree became diseased and was taken down in 1888. Near its former position is one, now nearly as large, raised from seed ripened in England by Sir T. D. Acland, Bart.

In 1843, by permission of the Queen, about 45 acres were added to the original Botanic Garden for the formation of a Pinetum. This included the ground formerly bounded by a wire fence, on which the Palm House now stands, and to the north, west, and south of it. Smith (*Records*, p. 291) says :—"The area was planted with conifers . . . . without any special arrangement." Many of these still remain, and have attained a considerable size; one of the most conspicuous is the fine specimen of *Pinus monticola*, now 56 feet high.

Kew owes its existing Pinetum to Sir Joseph Hooker, who has always taken a peculiar interest in this ancient and striking group of plants. A visit to Syria in 1860 enabled him to study the Cedar of Lebanon in its native locality. Perhaps one of the most interesting achievements of the late Turkish Ambassador, Rustem Pacha, was his successful efforts, while Governor of Northern Syria, to preserve what was left of the ancient grove.

In 1877 Sir Joseph Hooker's interest in Conifers was one of the main influences which induced him to undertake an extensive journey in Western North America. He brought back a rich harvest of specimens, which were deposited in the Kew Museum.

The Kew Pinetum has been carefully developed on the lines which Sir Joseph Hooker laid down. These are sufficiently indicated in the following extract from his Report for 1872 (pp. 4-5).

Pinetum.—This, which is by far the most important and extensive collection in the grounds, is now all but completed. In my report for 1871 I stated that the genera *Abies*, *Picea*, and a few others had been planted along the new walk on the south side of the lake. These extend for 160 yards on both sides of the path, and are now succeeded by the collection of *Pinus* proper, which extends from the termination of *Abies* to the Isleworth entrance (340 yards), and thence along the lined out path (100 yards) that leads to the Sion vista. The collection of *Pinus* proper also extends 100 yards up the new path skirting the Queen's Cottage grounds, where it is succeeded by the collection of Yews, Cypresses, Retinisporas, Taxodiums, Thujas, and smaller American and Japanese genera.

The Juniper collection is planted on either side of an avenue leading through the woods from the Lake to King William's Temple, and extends for 200 yards.

The classified and named Pinetum thus extends along nearly 2000 yards of path and avenue, representing double that length, or two and a quarter miles of made soil, beds, and plantations, except where interrupted by old trees.

The plants are throughout so arranged that the Old World species are as far as possible placed opposite to the American species of the same genera, and there are on the average 3–12 specimens of each

species or conspicuous variety, placed in groups. The number of specimens is about 1200, all I believe correctly named, with the exception of some doubtful ones. Almost every species that can be grown in the open air in this country is represented. Very few have been bought, the majority being plants procured by exchange and correspondence with different parts of the world, and through the liberality of various eminent nurserymen.

Whenever possible, the specimens in the old Pinetum have been transplanted to this, in most cases with apparent success, but of this there is no assurance till the spring is over. The specimen Pines in the Botanic Garden have not been removed.

It is only necessary to add that at the end of a quarter of a century the original plan has met with as much success as could be expected, looking at the great variety of species which it is attempted to grow under almost uniform conditions. A barren and arid soil has been congenial to some groups and fatal to others. Pines have on the whole prospered, while Spruces and Silver Firs have languished. In the latter case the maintenance of a collection illustrating Conifers as a whole can only be effected by constantly renewing it with young plants. As soon as these reach any size, they appear, under the conditions to which they are exposed at Kew, inevitably to die. It may be interesting to mention a few of the species which flourish on the Kew soil.

Ginkgo biloba (Maidenhair Tree) has already been referred to. This remarkable tree, a last representative of one of the most ancient types of plants, is apparently nowhere known in the wild state. In Japan it is only found in the precincts of temples where it has been almost certainly planted. Being deciduous it tolerates the neighbourhood of towns, and it is remarkable that it has not been more frequently planted in our parks. But its growth is slow.

Sciadopitys verticillata (Umbrella Pine) is represented by a vigorous specimen.

Taxodium distichum (Deciduous Cypress) bids fair to form a conspicuous feature on the islands in the Lake.

Cedrus atlantica (Atlas Cedar) grows with great rapidity at Kew. The *Deodar* (Cedrus Deodara), on the other hand, has greatly disappointed the expectations formed of it. The most shapely and graceful specimen which Kew possessed, 45 feet in height, stood on the west side of the Pagoda Vista, between the Palm House and King William's Temple. It was unfortunately destroyed by lightning on August 10th, 1895. (*Kew Bulletin*, 1895, p. 235.)

Larix europæa (Larch) grows well at Kew. Scattered through the woods are many fine specimens, the wood of which is of excellent quality.

Abies brachyphylla, from Japan, grows with great rapidity, and promises to be one of the most successful additions to the Pinetum from that country.

Pinus Coulteri is represented by a very fine specimen near the Cactus House (No. V.).

Pinus Laricio (Corsican Pine) has already been referred to.

Pinus excelsa (Bhotan Pine) is represented by numerous vigorous specimens.

Pinus monticola has already been referred to.

Of the specimen trees in the Botanic Garden some have been already mentioned.

Perhaps one of the most notable was the first specimen of the Chili Pine (*Araucaria imbricata*), the history of which is given in the *Kew Bulletin* for 1893 (pp. 24, 25). It died, and was removed in the autumn of the preceding year.

Several of the tender Conifers grown in the Temperate House are fine specimens of some age.

Agathis australis (Kauri Pine) was introduced to Kew in 1838 by "Sir William Symonds, then Surveyor-General of the Navy" (Smith, *Records*, p. 289).

Agathis robusta, according to Smith (*Records*, p. 290), was introduced to Kew in 1852, and grew freely in the Palm House. It was subsequently removed into the Temperate House, the conditions of which seem to suit it even better.

Araucaria Bidwillii (Bunya Bunya) was brought to this country in 1846 by Mr. T. Bidwill, who "was superintendent *pro tem.* of the Sydney Botanic Gardens" (Smith, *Records*, p. 67).

Araucaria Cunninghamii (Moreton Bay Pine) was discovered by Allan Cunningham in Queensland (probably about 1826), who forwarded plants to Kew, of which the existing specimen is the survivor. Some years ago it was much disfigured by a gust of wind which carried off about 25 feet of the top. The stump was trimmed, and a new leader was speedily produced, which eventually restored the symmetry.

Araucaria excelsa (Norfolk Island Pine), a native of Norfolk Island, according to Smith (*Records*, p. 66), introduced to Kew from New South Wales in 1793, by Governor Phillips (first Governor of New South Wales). The necessity for providing adequate accommodation for this and other striking plants led to the erection of the Temperate House, to which they were transferred in 1863. The habit of the specimen at Kew, which is now more than a century old, is a good deal altered (and perhaps improved) by the pruning necessary to keep it within bounds, even in its present position.

DXVI.—TROPICAL FODDER GRASSES.—
(continued).

We are indebted to Mr. Francis Watts, F.C.S., F.I.C., Government Analytical Chemist at Antigua in the Leeward Islands, for the following notes on certain fodder grasses that have been the subject of recent investigation by him:—

The accompanying analyses and notes may be of interest in connexion with the articles on Tropical Fodder Grasses in the *Kew Bulletin* (1894, pp. 373–387, and 1895, pp. 209–211), as supplying data concerning the food value of some of the grasses growing in the West Indies. It is hoped that time will be found to extend this series of analyses, but owing to pressure of other work, this will probably be only at irregular intervals.

Andropogon pertusus, Willd. Sour grass. This aromatic grass has been already described (*Kew Bulletin*, 1895, p. 210). It is doubtless one of the most valuable West Indian fodder grasses. It gives a large yield of hay in proportion to the weight of the fresh grass.

Chloris barbata, Sw. An annual grass, common along roadsides. As stated by Duthie, cattle do not appear to eat it when in flower.

Panicum prostratum, Lam. Cent. per cent. grass. A creeping grass, reported to be highly valued as a fodder. It yields a rich hay, but as the fresh grass contains a large amount of water, the yield is small.

Panicum colonum, L. Rice grass. This annual grass springs up rapidly after rain, and yields a very rich hay, but like the last, owing to the large proportion of water in the fresh grass, the yield of small.

Andropogon caricosus, L. Hay grass of Antigua. This is described by Mr. Barber in his "Notes on Antigua Grasses" in the Supplement to the *Leeward Islands Gazette*, October 4th, 1894 (*Bulletin* XXXII., p. 166):—

A grass which has many good points in its favour has largely established itself in the uncultivated land in the neighbourhood of Clare Hall. It has completely taken possession of the Gambles pasture between Skerretts and the town of St. John's.

Specimens sent to Jamaica and Kew were differently named; but, assuming the Kew determination to be correct, it appears to be *Andropogon caricosus.*

I do not at present know of it in any other West Indian Island, and some surprise was expressed at Kew at its presence in Antigua, because it is an East Indian species. It would be an interesting puzzle to determine how it found its way into our island.

It is known locally as a '*hay grass,*' and, if cut at the right time, should prove to be a very valuable fodder plant. The young blades clothe the ground with a beautiful coat of green, and it might be cut and stacked at the height of one or two feet according to locality. But the exact moment to cut it for hay is after the pollen has fallen, and before the seed has swollen. When the seed swells it draws for its nutrition from the stores in the stalks of leaves, and very little then is added to the plant from the ground. The seed is lightly detached, and then the grass is fit for little but bedding. One has a great advantage in deciding the time for cutting, in the fact that this grass monopolises the land to the exclusion of other species. It is difficult in mixed fields to choose the right moment for cutting, because the different species ripen at different times. Here no such difficulty is met with.

A marked feature in the grass is its variability according to soil, and its ready response to cultivation. While it may be frequently met with on the roadside one to two inches in height, in good rich land it will form a dense mass four feet high.

There should be no difficulty in cutting it by means of a mowing machine, and if done at the right time, probably at least two crops may be obtained in the season.

A great improvement is noticed if the land is lightly scratched by a cultivator after cutting. I have in mind a piece of land on the Clare Hall pasture which was cleared and lightly hoed, preparatory to the erection of buildings, I believe. The patch was, however, allowed to revert to pasture. When shown to me six months afterwards, it had been converted into a uniform piece of hay grass, with numbers of vetches or "winers" scattered amongst the grass.

The grass is not regarded as one of the first class Indian fodders, probably because of the widespread use of such others as the Bahamas

grass. A large quantity of fairly good fodder is said, however, to be obtained from it."

This grass appears to be an introduced species; it is spreading steadily, and where found is highly valued. Some attempts are being made to aid the spread of it by the distribution of seed. It is readily eaten by stock, and during the terrible drought of 1894 the heavy growth of this grass, which had dried *in situ*, on the pastures, formed the chief fodder for the animals at the Government Stock Farm at the Skerretts in this Island; it was freely eaten in this condition, and the animals throve upon it.

The following amounts of hay and water were yielded by these grasses when weighed immediately after cutting.

100 parts of fresh grass yielded the following weights of hay:—

—	Percentage of Hay.	Percentage of Water.
Andropogon pertusus (Sour grass) - - -	60	40
Chloris barbata - - - - -	35	65
Panicum prostratum (Cent. per cent.) - -	21	79
Panicum colonum (Rice grass) - - -	18	82
Andropogon caricorus (Hay grass) - - -	30	70

It is important to remember the very wide differences in the yield of hay when fodder is purchased in a green state. Probably the small proportion of water in "Sour grass," *Andropogon pertusus*, accounts in some measure for the esteem in which it is held as a fodder in Barbados and elsewhere.

All these grasses are described in Duthie's "Fodder Grasses of Northern India." Specimens are forwarded herewith in order that there may be no mistake as to the identity of the grasses analysed. The analyses were made on samples of grass cut when in flower, and the seed was just forming.

Tables of Analyses.

Composition of Hay.

—	Water.	Ash.	Nitrogen. Total.	Crude Protein.	Albuminoid Nitrogen.	True Protein.	Fibre.	Nitrogen, Free Extract.	Fat.
Andropogon pertusus (Sour grass).	10·92	5·50	·808	5·05	·700	4·378	29·75	37·71	2·075
Chloris barbata -	17·02	10·82	2·09	13·06	1·172	7·328	25·53	32·69	·884
Panicum prostratum (Cent. per cent.).	11·06	12·92	2·37	15·40	1·424	8·903	24·90	34·48	1·240
Panicum colonum (Rice grass).	15·62	12·91	2·649	17·21	1·648	10·303	23·69	29·54	1·025
Andropogon caricosus (Hay grass).	12·14	9·07	·738	4·79	·472	2·835	34·57	38·61	·820

Composition of Fresh Grass. Calculated from above.

—	Water.	Ash.	Nitrogen. Total.	Crude Protein.	Albuminoid Nitrogen.	True Protein.	Fibre.	Nitrogen, Free Extract.	Fat.
Andropogus pertusus (Sour grass).	46·55	3·30	·484	3·03	·420	2·626	17·85	22·62	1·245
Chloris barbata -	70·95	3·78	·731	4·57	·410	2·564	8·93	11·44	·309
Panicum prostratum (Cent. per cent.).	81·67	2·66	·488	3·17	·293	1·834	5·12	7·10	·261
Panicum colonum (Rice grass).	84·81	2·32	·476	3·09	·296	1·854	4·26	5·31	·184
Andropogon caricosus (Hay grass).	73·64	2·72	·221	1·43	·141	·850	10·37	11·58	·246

FRANCIS WATTS.

Government Laboratory,
Antigua, West Indies,
7th January 1896.

DXVII.—COTTON IN BRITISH CENTRAL AFRICA.

Cotton has long been cultivated in Central Africa. On the Zambesi and elsewhere it is now semi-wild.

The following correspondence relates to a sample of the produce sent to Kew by Her Majesty's Commissioner in British Central Africa:—

HER MAJESTY'S COMMISSIONER AND CONSUL-GENERAL, BRITISH CENTRAL AFRICA, TO ROYAL GARDENS, KEW.

Zomba, British Central Africa,
October 19, 1895.

DEAR THISELTON-DYER,

I SEND you by this post in a small canvas bag a specimen of the half-wild cotton of this country. It is cultivated by the natives in an indifferent manner since some 15 years ago, when they ceased weaving any cloth from their own cotton, preferring to buy the European manufactured goods.

This cotton is sent to me by a planter in the vicinity who states that he believes it to be of very good quality. Could you have it reported on, and let me know whether it really is a cotton which would fetch a high price? Opinions are divided as to whether it is or it is not worth our while to cultivate cotton. It grows half wild about the country, but it is said that the transport to the coast, which would cost about an average of 6*l*. a ton, would leave little or no profit to the planter.

Believe me, &c.
(Signed) H. H. JOHNSTON,
Her Majesty's Commissioner and Consul-General.

SECRETARY, MANCHESTER CHAMBER OF COMMERCE to ROYAL GARDENS, KEW.

Chamber of Commerce, Manchester,
January 9, 1896.

DEAR SIR,

I HAVE obtained an expert opinion upon the sample of Central African cotton referred to in your letter of the 6th instant, and have pleasure in reporting thereupon.

The fibre is of a woolly character, but it is clean and bright, though a good deal discoloured by what appear to be insect stains. The length of the staple is $1\frac{1}{8}$ inch to $1\frac{3}{16}$ inch, varying considerably in strength, but it is mostly very tender. It could probably be sold here at about $4\frac{1}{4}$*d.* per lb. at the present time.

Faithfully yours,
(Signed) ELIJAH HELM,
Secretary.

John R. Jackson, Esq.,
Kew Museum, Kew.

DXVIII.—SISAL CULTIVATION IN THE TURKS AND CAICOS ISLANDS.

The steps taken to establish a fibre industry in these islands were described in the *Kew Bulletin*, 1890, pp. 273–278. The plants under cultivation were determined at Kew to be identical with those grown in the Bahamas (*Agave sisalana*). A further account of the industry was given in the *Kew Bulletin*, 1892, pp. 31 and 32. In the following extract from a letter addressed to the Commissioner, Turks Islands, the Assistant-Commissioner reports that the plants are in excellent health, and the only difficulty is the want of sufficient machines to clear the leaves as they arrive at maturity. Since this report was written it is stated that machines have been introduced, and the export of fibre is likely to be greatly increased:—

Extract from a letter from the Assistant-Commissioner, Cockburn Harbour, to Commissioner, Turks Islands, dated 31st December, 1895.

"Of the Sisal industry I cannot say much. At West Caicos, it would seem, if output be the criterion, much is not being done; what is, would appear to be directed to weeding, clearing and systematic cultivation, rather than to shipment of the clean baled products. A limited number of the Blue Hills or Providence Cays people here get employment.

"In my recent visit to the scene of the wreck of the steamship 'Dorian' I travelled day after day for a week through these great stretches under cultivation by the East Caicos Fibre Company, a succession of regular well ordered tracts of some 1,200 acres in all. The growth and stages of maturity clearly enough mark the different yearly plantings with ample roads and plant space.

"The crop is far the finest I have ever seen in the Bahamas. I visited the cleaning sheds; the machinery is not equal to a third of the work to be done. There are very many leaves fit for cutting that lie untouched, and there are more plants poling than one would wish to see. I suppose that the condition of the market governs the business, but certainly there are scores of acres that require cutting.

"The labour afforded at Jacksonville in this hard year helped very considerably to alleviate the prevailing distress of the out-islanders."

In the Colonial Office Reports, No. 174, of 1896, it is stated that:—

"The export of sisal or Bahama hemp from the Turks and Caicos Islands is gradually on the increase, the value declared for 1895 being 620*l.* With the additional and improved machinery recently put up by each of the two companies engaged in this business, the output will probably be much larger."

DXIX.—SACRED TREE OF KUM-BUM.

The following communication from the Director was published in *Nature* for March 5, last :—

The eighth number of the *Bulletin du Muséum d'Histoire Naturelle* for 1895, which has just reached me, contains a paper by M. Édouard Blanc, entitled "L'Arbre à prières de Goumboum." This reminds me of a brief article which I contributed to *Nature* in 1883 (vol. xxvii. pp. 223, 224).

M. Blanc begins his account by the remark: "Je veux parler du fameux arbre qui croît dans un monastère buddhiste, au nord du Thibet, et qui produit des lettres, des mots, des prières et autres formules religieuses, le plus souvent tracées sur son écorce et sur ses feuilles." Of the actual fact he adds, "des voyageurs européens, M. Potanine et M. Grenard entre autres, ont apporté le témoignage de leur observation directe."

It is evident, then, that the tree still exists much as Huc and Gabet described it. And M. Blanc brought back with him to Europe a branch and a portion of the trunk. He says: "Le phénomène est véritable: il existe réellement, et j'ai vu des caractères thibétains très nettement tracés sur les branches de l'arbre en question."

M. Blanc discusses the cause. He dismisses the probability of their being either natural markings or the work of insects accidentally resembling alphabetic characters. He has no doubt that they are produced artificially, probably with the aid of heat.

In 1891 Mr. William Woodville Rockhill's book, "The Land of the Lamas," appeared; in it (pp. 67, 68) he gives the following account of the tree :—

"Although I did not see the convent treasure-house and the 'white sandal-wood tree' until later, I will describe them here. In a small yard enclosed within high walls stand three trees about twenty-five to thirty feet high, a low wall keeping the soil about their roots. These are the famous trees of Kum-Bum, or rather tree, for to the central one only is great reverence shown, as on its leaves appear outline images of Tsong k'apa. The trees are probably, as conjectured by Kreitner,* lilacs (*Philadelphus coronarius*); the present ones are a second growth, the old stumps being still visible. There were unfortunately no leaves on the tree when I saw it; and on the bark, which in many places was curled up like birch or cherry bark, I could distinguish no impress of any sort, although Huc says that images (of Tibetan letters, not images of the god) were visible on it. The lamas sell the leaves, but those I bought were so much broken that nothing could be seen on them. I have it, however, from Mohammedans that on the green leaf these outline images are clearly discernible. It is noteworthy that whereas Huc found letters of the Tibetan alphabet on the leaves of this famous tree,

* Kreitner, "Im Fernen Osten," p. 708. I was told that in spring these trees have large clusters of violet flowers, but if they are lilacs I am astonished that the Chinese do not speak of them as such, for that shrub is well known in Kan-su and throughout Northern China (*see* Prjevalsky. "Mongolia," ii. 79). Tibetans call all sweet-smelling wood *tsandan* (*i.e.* sandal-wood). Sir Joseph Hooker (*Himalayan Journals*, i. 298) says that the Lepshahs and Bhoteas call the funereal cypress *tsandan*. The Kum-Bum *tsandan karpo* is certainly not a cypress, however.

there are now seen only images of Tsong-k'apa (or the Buddha ?). It would be interesting to learn the cause of this change."*

I was anxious to see what could be ascertained from the leaves brought back by Mr. Rockhill. An application to my friend Prof. Sargent, at Harvard, procured me the following interesting letter :—

1914 N Street, December 23, 1893.

MY DEAR SARGENT,

As regards the famous Kum-Bum tree, I was not permitted, in any of my visits to it, to touch the tree, but I got a lot of leaves fallen from it, some of which I gave to the British Museum (Department of Ethnology), where Franks or Read would, I doubt not, be pleased to show them to Dyer.

From what the people at Kum-Bum told me, especially in view of their reference to the big bunches of violet flowers, I *thought* the tree might prove to be a lilac.

The bark turns up on the trunk like that of a birch. Kreitner is responsible for the identification of this "white sandal-wood" with the *Philadelphus coronarius*.

The roots from which the trees I saw were growing look very old, how old I cannot say, being ignorant in all such matters, the live stems are certainly not over 15 to 20 feet in height, and 4 to 6 inches diameter at the root, and some of them look very healthy. It may be that when Huc and Gabet visited this place (in 1842, I believe) the original trunk was yet alive.

They say that "three men could not stretch around the trunk," but he adds that it was not over 8 feet high. He must refer to an old dead trunk, out of which shoots were gowing. If this is not the case, we cannot have seen the same tree; that is all there is about it.

As to the "odeur exquise et qui approche un peu de celle de la cannelle," this must be hearsay, and refers to the popular belief that the tree is a sandal-wood, or else is a native simile for the odour of lilacs.

The large red flowers Huc also refers to may be violet ones. Mongol is not so precise a language, in fact certain colours which we would call violet are invariably called red by them.

Huc mentions the curling up of the bark.

On the whole, I am inclined to think that here as throughout his book, Huc's reminiscences of facts and hearsay have misled him. He certainly could not see the image on the leaves or bark, for even the Kum-Bum lamas, to whom I mentioned my inability to detect anything on the leaves they had given me, assured me that *faith was necessary*— "as one's faith is so is the clearness of the image on the leaf."

I hope the leaves will assist in throwing some light on the question.

Ever sincerely yours,

(Signed) W. W. ROCKHILL.

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* When Lieutenant Kreitner visited this place (1879), the images on the leaves were as at the present time. *See* "Im Fernen Osten," p. 707. The Arab traveller, Ibn Batuta, saw in the fourteenth century, at Deh Fattan, on the Malabar coast, in the courtyard of a mosque, a tree called "the tree of testimony." Every year there was a leaf on it, on which was written "by the pen of divine power" the formula "There is no God but God; and Mohammed is the envoy of God." The inhabitants used it to cure disease (*see* Ibn Batutah, Defrémery's Transl., iv. 85).

Sir Augustus Franks kindly sent me some of the leaves, accompanied with the following memorandum:—

"Leaves from the tsandan karpo ('white sandal-wood tree') of Kŭmbŭm, said to have sprung up on the spot where Toongkâpe's mother threw his hair when, having shaved his head, she consecrated him to the house.

"Used when ground as medicine—also carried in charm boxes.

"Collected by W. W. Rockhill at Kŭmbŭm in 1891."

They were carefully examined by Mr. W. B. Hemsley, F.R.S., Principal Assistant in the Kew Herbarium, who has long been engaged on a critical study of the Chinese Flora. He arrived at the conclusion that they belonged to *Syringa villosa*, a Chinese species. He published his determination in *Journ. Linn. Soc.*, (vol. xxx., p. 133), and I am disposed to regard it as correct. It confirms the statement of Kreitner (*Nature*, xxvii. p. 171).

Rockhill's identification with *Philadelphus* is a mistake easy of explanation. He has confused the popular and the scientific use of the name Syringa. Lilac is botanically *Syringa*; Syringa is botanically *Philadelphus*.

It will be seen from the accounts given above that the phenomenon is not consistent with itself at different times. This confirms the opinion of M. Blanc that it is an elaborate fraud.

W. T. THISELTON-DYER.

P.S.—I have omitted to add that Blanc says (*l.c.* p. 323):—" L'arbre paraît appartenir à la famille des Phytolaccacées ou à une famille analogue."—W. T. T. D.

DXX.—MISCELLANEOUS NOTES.

The Botanical Magazine for March.—The drawings of all the subjects figured were made from plants that flowered at Kew. *Incarvillea Delavayi* is a handsome new species from Western China, discovered by the Abbé Delavay. Kew is indebted to Mr. Max Leichtlin of Baden Baden for a plant of it. *Comanthosphace japonica* is a singular labiate from Eastern Asia. It was raised at Kew from seed presented by Prof. C. S. Sargent, Director of the Arnold Arboretum, Harvard. *Dipodium paludosum* is a pretty orchid, at home in the marshes of the Malay Peninsula. Kew received a plant from Mr. F. W. Moore, the Curator of the Glasnevin Botanic Garden. *Massonia jasminiflora*, a native of the Orange Free State, and a species of little ornamental value, was sent to Kew by the Rev. F. O. Miles, of Almonbury, Bristol. *Utricularia janthina* is a very fine Brazilian species, imported by Messrs. Sander and Co. Like some other species it grows epiphytically, in th axils of the leaves of a species of *Vriesia*.

Botanical Magazine for April.—The plants figured are *Posoqueria macropus*, *Hypocyrta pulchra*, *Olyra concinna*, *Catasetum Randii*, and *Phaleria ambigua*; all from plants cultivated at Kew.

Posoqueria macropus, a native of Brazil, is remarkable for its long, tubular, fragrant flowers. *Hypocyrta pulchra* was obtained from Messrs. J. Veitch and Sons, who had imported it from New Granada It is the most brilliant-coloured species of the genus. *Olyra concinna*

an elegant grass, native of Costa Rica, was received at Kew in 1891, in a box of filmy ferns, sent by Mr. C. Winkler from San José. Plate 7470 represents a male plant, and one female flower of *Catasetum Randii*, which was described in the *Bulletin*, 1894, p. 394. A living male plant was communicated to Kew by E. S. Rand, Esq. of Para, from which, when it flowered in March 1895, the present drawing was made. The female flower was received from the same gentleman, preserved in alcohol. *Phaleria ambigua*, a native of Java, is a climbing shrubby plant allied to *Daphne*. It was sent to Kew by Dr. Treub, Director of the Buitenzorg Botanical Gardens, to whom we owe many interesting additions to the Royal Gardens.

Botanical Magazine for May.—*Ostrowskia magnifica*, a remarkably showy plant, allied to *Campanula*. The drawing was made from an exceedingly vigorous specimen communicated by F. Ducane Godman, Esq., F.R.S. It is a native of Central Asia, where it grows at an elevation of 7000 feet. *Pittosporum eriocarpum*, a native of the Himalaya, is a handsome species, which may prove hardy in the south-western parts of the British Islands. The specimen figured was received from Marchese Hanbury, F.L.S. The drawings of *Cochlioda noezliana*, *Coffea stenophylla*, and *Masdevallia corniculata*, var. *inflata* were prepared from plants cultivated at Kew. *Cochlioda noezliana*, native of Peru, was discovered by Mr. John Noezli, who sent it to Messrs. Linden in 1891. The Kew plant was purchased. *Coffea stenophylla* is one of the two indigenous West African species which are becoming important commercially (*Kew Bulletin*, 1893, p. 167). It was raised from seeds sent from Kew in May 1894, by Sir W. H. Quayle Jones, late Chief Justice of the West African Settlements, and Acting Governor of Sierra Leone. The *Masdevallia*, a native of New Grenada, was received at Kew from the fine collection at Glasnevin, under the superintendence of Mr. F. W. Moore.

Hooker's Icones Plantarum.—The third part of the current volume, containing plates 2451 to 2475, illustrates a number of interesting plants from Borneo, China, Madagascar, Tibet, and other countries. Among the Bornean plants, *Creaghiella*, an ornamental new genus of Melastomaceæ, and *Baphia borneensis*, are specially noteworthy. The latter is an outlying member of a remarkable genus of the Leguminosæ, otherwise only known from Tropical Africa and Madagascar. *Platykeleba*, a new genus of Asclepiadeæ, from Madagascar, is a small leafless shrub belonging to the tribe Cynancheæ. The Chinese flora is represented by *Lithospermum hancockianum* and *Elæocarpus hainanense*, both very handsome, and *Pterygiella*, a new genus of Scrophularineæ, allied to *Euphrasia*. Plates 2467 to 2472 are devoted to novelties from Mr. Littledale's Tibetan collection, made at an elevation of about 16,500 feet. They include a new species of the rare and curious genus *Oreosolen* (Scrophularineæ), and *Littledalea*, an elegant new grass, allied to *Glyceria*. This is of a beautiful purple colour, at least when dry. *Ischnochloa* and *Duthiæa* are two new genera of grasses from North West India. *Pentadesma butyracea*, the "butter tree" of West Tropical Africa, is for the first time adequately figured. And *Homalopetalum* is a new genus of orchids, of the tribe Epidendreæ, from the Blue Mountains of Jamaica, characterised by having all the parts of the perianth alike in size and shape.

Flora Capensis.—The continuation of this work, of which three volumes were published by Harvey and Sander, has been resumed. It was brought to a standstill by the death of both authors, and the last volume was published in 1865. Part I. (pp. 1–192) has now been issued under the authority of the Governments of the Cape of Good Hope and Natal, and the editorship of the Director.

The following statement is an extract from the prefatory note:—

The three published volumes of the *Flora Capensis* only included the southern portion of South Africa outside the tropics. In the continuation it is intended to describe, as far as possible, all known flowering plants occurring in the area lying between the tropic of Capricorn and the ocean. To the north it will be supplemented, there fore, by the *Flora of Tropical Africa*.

The volume, of which the present part is an instalment, will be of more than ordinary interest to horticulturists as well as to botanists, as it will include the whole of the plants known familiarly as "Cape Bulbs." The cultivation of these was popular on their introduction by Masson at the end of the last, and by Bowie at the beginning of the present century, and the taste for them has of late years revived. The present part includes the whole of the *Irideæ*, which from a cultural point of view are peculiarly attractive. The volume has long been in preparation, but its publication has been from time to time delayed by the desire to include in it the novelties which have been continually received as new territories to the north have been explored. It has been entirely elaborated by Mr. John Gilbert Baker, F.R.S., the keeper of the Herbarium and Library of the Royal Gardens, who has long been the accepted authority on the Petaloid Monocotyledons.

The whole area occupied by the flora has been broken up into regions, the physical characters of which will probably be found tolerably well marked. These have been adopted in great part from the important paper, "Sketch of the Flora of South Africa," by Harry Bolus, Esq., F.L.S., printed in the Cape of Good Hope "Official Handbook," at the Colonial and Indian Exhibition, 1886 (pp. 286–317).

They may be briefly defined as follows:—

i. Coast Region.—Includes the narrow belt lying between the south-western and southern coasts from the Oliphants to the Kei rivers and the Zwarte Bergen range.

ii. Central Region.—Can only be roughly defined as lying between the coast and the Kalahari regions.

iii. Western Region.—Extends from the tropic to the Oliphants river, and includes Great and Little Namaqualand.

iv. Kalahari Region.—Includes the Kalahari, Bechuanaland, Griqualand West, Transvaal, Orange Free State, and Basutoland.

v. Eastern Region.—Includes the belt lying between the eastern coast from the Kei river to the tropic and the Drakens Berg range. It therefore comprises Natal, Zululand, Griqualand East, &c.

The plants of the older collectors, which are often destitute of precise localities, have been simply referred to under the general head of South Africa.

Botanical Department, Jamaica.—The late Governor of the Colony took occasion to give emphatic testimony to the value of the work done by the Department of Public Gardens and Plantations:

EXTRACT from a PAPER by His Excellency General Sir H. W. NORMAN, G.C.B., G.C.M.G., &c., read before the AUSTRALASIAN ASSOCIATION for the ADVANCEMENT of SCIENCE, at Brisbane, Queensland, January, 1895.

A WEST INDIA ISLAND [JAMAICA].

I must not omit to mention that there is a botanical department in the island, with large gardens and plantations at different elevations, where much experimental cultivation is carried on. It is, no doubt, greatly owing to the exertions of this department that the fruit trade has become so important, and there now seems a prospect of tea being grown in some quantity. The cultivation of cinchona, which was commenced with some spirit several years ago, has not been so successful as was anticipated. This, no doubt, has been in some measure due to the great fall in the price.

It is interesting to note that nearly all the valuable trees and plants which now abound in Jamaica have been brought from other parts of the world. The sugar-cane, coffee, the logwood, the mango, the nutmeg, the bamboo, and many others have all been imported, as well as the guinea-grass, which enables large quantites of good cattle and horses to be raised and nourished. (Report, p. 481).

Trinidad Vanilla.—A sample of Vanilla grown and cured at the Botanic Gardens, Trinidad, was lately received from Mr. J. H. Hart, F.L.S., the Superintendent. The pods were produced by plants originally supplied from Kew, of what is known as the "Sion House variety," of *Vanilla planifolia*, Andr. In the present instance the quality is not so good as might be desired; but now the right sort is established in the island it might be worth while to carry on further experiments with the view of improving the quality of the produce:—

MESSRS. BURGOYNE, BURBIDGES & CO. TO ROYAL GARDENS, KEW.

12 and 16, Coleman Street,
London, E.C.,
February 12, 1896.

DEAR SIR,

I AM in receipt of your favour of the 8th instant enclosing samples of Vanilla beans grown in Trinidad.

These beans are somewhat mixed in character, and do not appear to be very well cured; they are, however, fairly meaty, but their flavour is coarse. They would be worth nominally from 10*s*. to 11*s*. per lb.

I remain, &c.
(Signed) H. ARNOLD.

J. R. Jackson, Esq.,
Museum, Royal Gardens, Kew.

Timber in Newfoundland.—The lumber industry has made extraordinary progress in Newfoundland in the last five years. The following

particulars are taken from the *Annual Report for* 1894 presented to Parliament in May, 1896 :—

It affords me much gratification to again report most favourably upon this branch of our industries. Its expansion has been most rapid, as the following comparative statement will show :—

Year.	M feet.	Valued at
		$
1888	30	360
1889	5	50
1890	1,329	21,180
1891	1,431	28,620
1892	2,355	47,100
1893	3,073	45,986
1894	6,357	82,641

The above gives the amount exported, but in addition to this a very large quantity is annually used for home consumption.

In this connexion I would observe that the amount of timber which has been destroyed by forest fires in this Colony is exceedingly large, and can only be appreciated by those who have travelled much in the interior. Forest fires are no doubt due occasionally to lightning, but most of them are traceable to the carelessness of hunters and travellers. In the partially inhabited regions, fires originate by the settlers burning brush and logheaps in clearing the land. The question has arisen as to whether anything can be done to prevent this destruction of the timber of the country. There is a law upon the Statute Book which deals with the subject, but no adequate means have heretofore been provided for enforcing it. It is considered that the appointment of conservators or forest guardians whose duties, in addition to preventing the destruction of the timber by fire and otherwise, might be directed to promoting the growth of existing timber, checking the stumpage upon granted areas and preventing encroachments upon ungranted Crown lands, will undoubtedly repay the cost that will be entailed. These officers will have the power to arrest or lay information against persons suspected or known to have wilfully, or by their negligence, set fire to the woods. As matters now stand, many guilty persons are allowed to escape through the reluctance or fear which disinterested or private individuals may have in regard to informing against them.

Shirley Poppy.—The origin of this attractive garden annual has been investigated by Dr. Prain (*Journ. As. Soc. Beng.*, 1895, pp. 306, 307). He says:—

"The form seems to have originated in Indian gardens, and is supposed to have very recently been introduced to European culture. This is, however, not quite exact, for the poppy now known as the Shirley Poppy, which seems to be undoubtedly *P. Rhœas*, var. *latifolia*, has been in continuous cultivation in Scotland for over half a century." It is *P. Hookeri*, Bak., figured in the *Bot. Mag.* t. 6729.

Typical *P. Rhœas* is stated by Dr. Prain to be "an extremely rare plant in India."

Trichopteryx elegans.—The genus *Trichopteryx* belongs to the tribe Aveneæ of grasses, and is a small one, of which all but one of the species are confined to Tropical and South Africa. We are indebted to a correspondent in British Central Africa for the following interesting account of the mode of dispersion of the seeds. This may be added to the instances, the general mechanism of which is discussed by Mr. Francis Darwin in the *Trans. Linn. Soc.* (*Bot.*) vol. i. (1880), pp. 149–167.

EXTRACT from letter from Mr. Kenneth J. Cameron to Royal Gardens, Kew, dated Namasi, January 7, 1896.

In this part of Africa there is a grass which any person travelling through the bush is almost sure to have some experience of. One end of the seed of this grass is very sharp, so that it can penetrate any clothes, and there are hairs or bristles on it arranged so that wherever it enters these hairs prevent it from returning the same way. Upon every movement this seed penetrates until it reaches the flesh, the result being a constant itch until it is removed. This grass grows fully 6 feet high, and is a common grass for thatching. My attention was drawn to this grass upon hearing a constant rustle among it just about sunrise. I examined it and found almost all the awns with seed attached twisting and turning in all directions, and latterly dropping to the ground where this movement was continued. The cause of this movement was the rays of the sun striking the grass and the heat had affected the awns. Since then I have taken more interest in this movement. If the awns are laid in shallow water they commence to move, or a change of temperature has the same effect. I have seen the awns fall on a box of soil, quite a lot of them, all over the surface, some time after they would find their way to the side of the box and penetrate between the side of the box and the soil, the end with the seed in the ground and the awn standing perpendicular. Had there been a hole or indent in the soil some would penetrate there. Supposing a perfectly level hard piece of ground with no grass on it; place a stone in the centre and let these awns fall all over the ground. The awns coming across this stone in their movements will penetrate between the stone and the soil, the seed end in the intersection. The awn has two joints dividing it into three parts.

Suppose it to be lying flat, its first movement is lifting the seed end clear of the ground or surface. When there are a lot together they form a ball or bunch and roll along. Upon reaching their destination they stand straight up with the seed in the ground. When there are a large quantity they form quite a mat. At the joints there is a screw-like formation, which either coils or uncoils in its movements.

Rhodomyrtus tomentosa.—Mr. Proudlock, curator of the Government Gardens in the Nilgiris, has recently drawn attention to this plant, which is known to Europeans at Ootacamund as the "Hill Gooseberry." The fruit is about the size of a cherry, dark purple, with a sweet and aromatic pulp. It is eaten raw or made into jam. The latter is known as "Thaouty," and is highly esteemed. The jelly is also excellent. A specimen received for the museum at Kew had some resemblance to apple jelly, but was not quite so sharp. The plant is very common on the higher mountains in Southern India, and extends to Ceylon and the Malay Peninsula. It is cultivated in two forms in the Temperate House

at Kew, and forms an attractive plant. It has also been grown to a limited extent in greenhouses in this country for the sake of its large pink flowers, which are ½ to ¾ inches across.

In the Nilgiris *Rhodomyrtus tomentosa* is a shrub 4 to 5 feet high. The young branches and leaves are clothed with a thick tomentum. The lower leaves are generally in threes, while the upper ones and those of the branches are opposite; they are 1 to 2½ inches long, with three, or rarely five, prominent nerves, dark brown and shining above, hoary beneath. The flowers are arranged one to three together on stalks about one-half the length of the leaves. The wood, usually of small size, is white with a pink heart, "the grain close and cutting like cheese"; it is useful for small turnery. In sub-tropical countries the plant might be usefully introduced both as an ornament and to supply fruit. The latter could no doubt be greatly improved by cultivation. It would be more desirable in every way than the Guava and similar myrtaceous fruits.

Sechium edule.—This cucurbitaceous plant, commonly known in the West Indies as the Chocho, Christophine or Vegetable Pear, was fully described in the *Kew Bulletin*, 1887, for August, p. 6. It was there stated that "the introduction of this useful plant to some of our "possessions in the East Indies was effected during the last two or "three years, and already very gratifying accounts have been received "of it."

The following extract taken from the *Annual Report on the Government Gardens and Parks in Mysore* for the year 1894–95, p. 12, shows that the Chocho has now been taken up by the natives of India, by whom it is regarded as one of the most wholesome of foods:—

"One practical outcome of the Nundydroog nursery is that the cultivation of 'Chocho' (*Sechium edule*) has been taken up in several villages at the foot of the hill. The labourers who are occasionally employed from these villages will, in all probability, utilise other garden products in the same practical manner. Chocho is now quite established as a popular vegetable in Bangalore and the adjacent villages. The fruit has also been widely distributed to other towns in the province. It is largely used in the Central Jail, where the fruit is carefully grown, and considered to be one of the most wholesome foods for prisoners. It is not generally known, however, that the large fleshy root of the plant, 'sometimes weighing nearly 20 lbs.,' can be cooked and eaten like a yam."

The chocho is also being grown in this country under glass to supply Covent Garden Market. It lends itself very readily to the same conditions as those adopted for tomatos, grapes, and cucumbers, but hardly requires so much heat as the latter. The large flat single seeds, if carefully cooked, are regarded as a great delicacy.

Erratum.—For "Shiruba," last line but one, page 85, read "Shimba."

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

Nos. 115–116.] JULY and AUGUST. [1896.

DXXI.—SHEEP-BUSHES AND SALT-BUSHES.

In the warmer and drier parts of the world lands devoted to pastoral industries are not always clothed with the grassy vegetation familiar in temperate countries. Its place is taken by dwarf shrubs and herbaceous plants other than grasses, but which are no less valuable. The experience gained in South Africa and Australia admits of practical application in other parts of the world, especially where, as will be seen, the soil is intolerant of any other kind of vegetation.

The following information has been put together to meet the demands of correspondents. As long ago as 1869, Kew took steps to bring the subject under the notice of the colonies. (See *Kew Report*, 1882, pp. 21, 22.)

Sheep-Bushes.

In Museum No. III. of the Royal Gardens, a large case contains a series of plants belonging to various natural orders, illustrating the vegetation of the Karroo region of South Africa.

The most important of these as a fodder plant is *Pentzia virgata*, belonging to the great order of *Compositæ*, and a near ally of our common Tansy (*Tanacetum vulgare*) and Wormwood (*Artemisia*).

Professor MacOwan writing to Mr. J. F. Duthie, Superintendent of the Government Botanical Gardens, Saharanpur, in 1884, gave the following account of the Cape sheep-bush:—

" *Pentzia virgata*, Less., the 'Goed-Karroo Bosje' covers large areas of the Karroo Veldt in the centre of Cape Colony. It is a dwarf tufted composite, with discoid heads rising a few inches above the cushion-like mass of twigs and foliage. The general colour is a dull, glaucous green. The side branches come out, arcuately bend over, touch the ground, and in the wet season root at the tips. It is just this peculiarity which renders the plant so valuable, for as our farmers overstock the farms with sheep, and do not even keep the stock off certain parts for recovery in their turn, the veldt is cut up into innumerable sheep tracks, each of which becomes a swift running waterway in the rainy season. Thus a badly-managed farm presents a curious hammocky appearance, as if the bushes were each perched on a little eminence with bare soil around. The *Pentzia*, if only the stock be kept off, corrects this very soon. The arcuate branches touch the curved hollow of the

track, root there, and collect a quantity of water-borne dèbris to which each rain adds, until a new hummock arises right in the centre of the water-run. Obviously this process ends in the renovations of the veldt and turning the water out of channels on to the level.

"If you have soil of the deep, fertile, lacustrine loam of our Karroo, you might grow *Pentzia*. But it is not a plant for barren sand." [*Report on the Government Botanical Gardens at Saharanpur and Mussoorie*, 1884, *p.* 9.]

The *Report of the Royal Gardens, Kew*, for the year 1873, p. 5, states that the "*Sheep-bush* of the Cape of Good Hope" was successfully introduced to South Australia by seed sent from Kew in 1869. Dr. Schomburgk, Director of the Botanic Garden, Adelaide, remarked: "I raised about 20 plants, which have done remarkably well, and prove that our climate is well adapted for their growth. . . . The leaves and branches contain an aromatic bitterness which, I understand, is liked very much by sheep, and which gives the mutton a fine peculiar flavour. The plant is easily propagated from cuttings of which every one will grow if planted when the first rains begin to fall."

In his report for 1883 (p. 5) Mr. Duthie wrote :—

"The sheep-bush of South Africa has been tried in Australia for several years and is highly spoken of as a fodder plant. Seeds were received at the Saharanpur Garden from Dr. Schomburgk."

The attempt to establish it on the saline or *usar* lands in North-western India, was, however, unsuccessful. After repeated efforts Mr. Duthie reported in 1887 "it is needless to make further attempts to cultivate the sheep-bush in this part of India."

The following later information is taken from the *Agricultural Journal*, Cape Colony, of December 3, 1891 :—

"Mr. E. G. Alston, of Van Wyks Vley, has kindly responded to our request and sent a small quantity of the seed of the Schaap Bosch which will be sent to Australia. For Cape farmers it would be preferable to get rooted layers for planting which Mr. Alston is also prepared to provide.

"This plant, as Prof. MacOwan pointed out some years ago, makes natural layers in the loose gravel of the sheep-tracks worn between the bushes; it roots, and collects soil by damming up the channel, thus turning the water out on the level.

Mr. Alston says at the end of his communication :—"Our intelligent farmers begin to see the necessity of providing bushes and grass in the place of those that fail to stand the close cropping by sheep and the evils attendant on a heavily stocked sheep walk. The time is within measurable distance when in these northern districts we shall have of set purpose to grow stock-food bushes on our farms, or else leave large tracts for years to recover themselves. To allow parts of a farm to lie fallow means loss, and with our periodical droughts I wonder how long we could resist the temptation to put starving sheep upon reserved and forbidden ground."

Salt-Bushes.

In many parts of the world the soil is impregnated with alkaline salts, especially of soda, to a degree which is insupportable to most kinds of vegetation. Happily, one family of plants, the Goosefoots (*Chenopodiaceæ*), is an exception.

They are tolerant of soda salts, and many species occur plentifully in consequence in maritime situations in temperate countries. In the

preface to his *Iconography of Australian Salsolaceous Plants* Sir Ferdinand von Mueller writes:—

"The 'salt-bushes' constitute in many wide tracts of our island-continent the prevailing vegetation, and on this depends locally to a large extent the sustenance of herds and flocks. Moreover, this kind of pasture nutriment has proved so particularly wholesome, that 'salt-bush' country has become among Australian ruralists quite famous, . . . more particularly as (salt-bushes) will live even through the direst periodic droughts."

He adds:—"That under such circumstances these important plants may finally succumb through continuous depasturing, cannot be surprising; thus, the necessity is forced on the proprietors or holders of 'runs' to renew the salt-bush vegetation by methodical sowings."

Sir Ferdinand Mueller wrote June 2, 1894:—"The frosts to which in the dry interior of Australia the best shrubby species of *Atriplex* are exposed are not severe. They may, however, survive, perhaps, rather hard frosts, and spring from the root again. For testing this we have no ready means in this mostly winterless clime. I should think that the shrubby Australian species of *Atriplex* will prove to have a similar constitution to *A. Halimus*, which seems to grow naturally not far north of the Mediterranean."

Australia possesses about 112 species of *Chenopodiaceæ* belonging to 15 genera of which eight are peculiar to it. Of these *Rhagodia*, *Chenopodium*, *Atriplex*, *Enchylæna*, *Kochia*, *Chenolea*, and *Sclerolæna*, furnish salt-bushes available for pasture. For a detailed account of them reference may be made to Sir Ferdinand Mueller "Iconography" (1889–92) already mentioned, to the same writer's "Select Extra-tropical Plants," ninth edition (1895), and to the excellent monograph on "The Forage Plants of Australia" by F. Turner, F.L.S. (1891) published by the Department of Agriculture, New South Wales, in which Mr. Turner holds the position of botanist.

Only a few of the Australian species which are likely to prove useful in other countries will be discussed in this article.

Their value is clearly pointed by Mr. Turner (p. xviii.). "Once the salt-bush plants are established they will continue to grow under the most adverse circumstances of drought and great heat. In fact, very few other kinds of plants so useful for fodder purposes could exist under such adverse circumstances as do most kinds of the salt-bush family. There is abundant proof that when sheep are depastured in a country where plenty of salinous plants are growing among the natural grasses, fluke and other allied ailments are almost unknown. It has been also said that horses which are subject to swamp cancer on the low coast lands, when turned into pasture where salinous plants are plentiful, soon lose this disease."

The present position of "salt-bush" plants in Australia is, however, not satisfactory. Mr. Turner states (*ibid.*):—"These most valuable plants are from year to year becoming scarcer on the central plains of this continent. Being so closely fed down they get little chance to mature seed, which is their only natural means of reproduction. When left unmolested for a time, however, they will produce an abundance of seed which germinates readily under ordinary conditions. Many of them also are readily increased by cuttings, so that it would require no great outlay to enter upon a proper system of conservation or even cultivation."

And further (p. 66):—"If nothing is done to perpetuate these valuable pasture plants, Australian wool will depreciate; for it is solely

on account of our superior indigenous forage plants and grasses that our wools take such a high place in the market."

Of all the Australian salt-bushes, *Atriplex nummularia*, Lindl., is, perhaps, the one which has attracted most attention.

Turner (p. 57) gives the following account of it: "*A. nummularia*, Lindl., is a shrub which attains a height of from 6 to 10 feet, and is covered all over with a scaly tomentum. The leaves are variable but are mostly orbicular, rather thick and slightly sinuate-toothed. The plant is diœcious, that is the two sexes of the flowers are borne on separate individuals. It is peculiar to the Macquarie, Castlereagh and Darling rivers, and the arid western plains in New South Wales, Darling Downs in Queensland, Murray Scrub in Victoria, and the interior of South Australia. At one time it was moderately plentiful, but the overstocking of the runs has had a most serious effect on the plant, and in some places it is nearly exterminated. Cattle, sheep and other herbivora are so extremely fond of it, and crop it down so closely, that it has little chance to recover, much less produce seed in sufficient quantities for its natural perpetuation. Its drought-enduring qualities are remarkable, for it stands the hot winds on our arid central plains throughout the summer months with little check upon its growth. Such a valuable fodder plant is well worthy of extensive conservation and culture, and if this be not done within a very few years, it will then be practically impossible, except under very careful management. When not too closely fed over, the plant will seed in abundance, and the seed germinates readily under ordinary conditions. It will also strike readily from cuttings put down in the common way. Hence no great outlay will be required for a proper conservation, if it be taken in time. The woody part of the plant amounts to 10 per cent only; the other 90 per cent. is food and moisture."

An analysis of the dry plant ash, which amounts to 31·28 per cent., shows the amount of alkali and other salts it contains, and which add very greatly to its value as a change-food for sheep affected with parasites.

Potash	4·91
Soda	9·25
Common Salt	9·47
Lime	2·71
Magnesia	2·12
Iron oxide	0·20
Sulph. oxide	0·99
Phosph. oxide	1·28
Silica	0·35
	31·28

The plant itself contains—

Carbohydrates	42·85
Oily matter	2·18
Albuminoids	16·45
Woody fibre	7·24
Ash as carbonates	31·28
	100·00

There are large tracts of land in India and especially in the north-west provinces and the Punjab where efflorescent salts are so abundant that the land is rendered more or less sterile. The term *reh*, is the general vernacular name in India for efflorescent salts. In the Upper Punjab the efflorescence is known as *Kallar*, and in Oudh and other parts of India the affected lands are called *usar*. (The *usar* grass is *Sporobolus arabicus*, Boiss.) Large sums of money have been spent in providing canals for irrigation purposes and in the endeavour to make *usar* lands productive. It has been proved that irrigation by canal water, when not accompanied by deep drainage, has had the remarkable effect of increasing the amount of *reh* deposits in the soil

and in consequence large tracts have been thrown out of cultivation. This has been done by raising the level of the sub-soil saline waters and so bringing them into injurious contiguity with the superficial layers of soil. Thus is explained the apparently paradoxical fact that irrigation, by comparatively pure canal water, has been followed by an increase of salts in the superficial soils.

Efforts were made about the year 1880 to introduce the "salt-bush" plants of Australia for experimental cultivation on the *usar* lands. Seeds in the first instance were received at the Saharunpur gardens from the Melbourne Botanical Gardens. In his *Report* for the year ending 31st March 1882, p. 9, Mr. J. F. Duthie, F.L.S., wrote "The Australian salt-bushes and their allies have been only very lately sown but the progress they have made is so far in their favour. There are several plants of *A. halimoides*, *nummularia*, and of two other species thriving very well." In 1883 "the small plantation of salt-bush plants continued to thrive. The plants were four to six feet high." It was suggested that as the salt-bush is essentially a desert plant it should not be permanently transplanted until after the rainy season is over; "this injunction applies more particularly to those parts of north-west India where the rains continue for any length of time. As soon as the plants had had sufficient time to establish themselves no amount of rain is likely to injure them."

Experiments with salt-bush were also carried on by the Director of the Department of Agriculture and Commerce of the North-western Provinces and Oudh. The plants were put out on *usar* soils, and the reports upon the early experiments were encouraging. In Appendix II. to the *Report* of the Department for the year 1883, Mr. W. J. Wilson stated that plants of *Atriplex nummularia* and other species were received from the Sahurunpur Gardens in July 1882, and again in July 1883. "Of these plants," he says, "*A. nummularia* promises to be the most valuable as it has an abundant leaf growth and should yield a large supply of fodder." In 1884 the plants were thriving. In 1885 Mr. Wilson reported "that the Australian salt-bush . . . gave promise even in bad *usar*." In 1886 the Awa *usar* plantation was handed over to the Rajah of Awa, and the further experiments were transferred to the *usar* land near Cawnpore and Aligarh. In Appendix C. to the *Report* of the Department for the year 1889, p. 9, the following note is made by the Director of the Botanical Department on the result of his inspection of the Aligarh plantation:— "The salt-bush (*Atriplex nummularia*) promises to be a success as far as the soil is concerned, the most healthy specimens being those which were planted in soil strongly infected with *reh* salts; but being essentially a desert species the excessive damp to which it is exposed in the Doab during the hot rainy months is prejudicial to its nature. At this season also it is liable to attacks of innumerable caterpillars, which devour the leaves and weaken the plants." This is the latest information given by the Department of Agriculture of the North-western Provinces and Oudh.

The experiments carried on concurrently with the above at the Saharunpur Gardens are detailed below:—

"Salt-bush (*Atriplex nummularia*).—The plantation of this fodder plant continues to exist in a healthy state. The seeds produced last year by the plants in the plantation proved to be the soundest lot we have as yet obtained from them. Formerly the seeds collected from these plants germinated very sparingly, but this season nearly every seed came up, with the result of a stock of 3,500 young plants. These

have all been bespoken by the Director of the Botanical Department, Northern India, for planting out next autumn in the *usar* reserves. The whole stock is therefore being retained for that purpose." (*Report* for 1888, p. 11.)

"The large stock of young plants made mention of in the last report was taken over by the Director of the Botanical Department, and were planted under his direction in the *usar* reserves of the Aligarh and Cawnpore districts. Another large batch is now under propagation for disposal in the same manner during the current season." (*Report* for 1889, p. 10.)

The last official note on the Salt-bush at Saharunpur is contained in the following extract from the *Report* of the Garden for the year ending 31st March 1890 (pp. 11–12) :—

"A few plants of this fodder were planted out last rains to take the place of some which had died. A considerable number of plants remain on hand for distribution, but there was no call for them during the year. The Director of the Botanical Department, Northern India, having now been supplied with as many plants as he cares to try in the Aligarh and Cawnpore *usar* reserves, there is little probability of any extensive demand springing up until something definite has resulted from his experiments. For the present, we will therefore discontinue propagation, but keep up a small stock plantation in case the Aligarh and Cawnpore experiments should turn out to be sufficiently encouraging for trying this plant on a larger scale at some future period."

The following detailed information respecting the introduction of the Australian-salt bushes into Cape Colony and the success which has been obtained with them is taken from the *Agricultural Journal of Cape Colony* for the 18th May 1893 :—

(*Atriplex nummularia*, Lindl. and *A. halimoides,* Lindl.).—The following interesting report by Mr. E. Garwood Alston, of Van Wyk's Vley Estate, giving an account of his success in acclimatising the plant and distributing the seed of the Australian salt-bush, which has proved of such immense value as fodder plant in this colony, is published for general information :—

In April 1886, a year or two after my father had commenced the evolution of an agricultural centre from a dam and a desert stretch of Karoo, Professor MacOwan, our kind and constant adviser in botanical matters, sent us six seeds of *Atriplex halimoides,* Lindl., one of the Australian salt-bushes, for trial here. Only two came up; one died before reaching maturity, and the other represents the mother plant of all the *A. halimoides* found in this country.

Later on a second packet of *A. halimoides*, Lindl., and *A. nummularia* Lindl., was sent by Professor MacOwan (they had been obtained from Sir Ferd. v. Mueller, the Government Botanist of Victoria), but as we had established the first-named, only *A. nummularia* was sown, with the result that in a year's time we were in possession of a patch large enough to supply seeds in fair quantities to farmers and others.

All the seeds were sown from half-an-inch to an inch deep in brackish clay soil, and after the plant once commenced to mature its seed, it propagated itself rapidly enough to enable us to keep up the supply in spite of heavy demands every year.

I should not like to say that, as a fodder plant, the Australian species are better than our own *Atriplex Halimus*, but the popular idea locally is that the Australian species is less salt, and more can be eaten by cattle and sheep.

Our own preference for the stranger is caused by the larger quantity of food produced in a given time, its capability for seeding profusely for nine months out of the twelve, and the ease with which it can be raised. At Van Wyk's Vley the following animals feed on it in preference to our native *Atriplex* :—Cattle, horses, donkeys, sheep, goats, pigs, fowls, and even ants! It is just possible that the reason may lie in the ability of *A. Halimus* to absorb more saline matter from the soil than its cousins, and if so it is *primâ facie* an argument in favour of the Cape plant being sown in preference to the Australian, where there is but little salt in the soil.

The drawback to the Cape variety is the small number of fertile seeds it yields yearly, and its failure to find out the defensive habit its cousins have acquired to keep the soil cool and moist for the seedlings by dropping over them a heavy mulching of withered leaves and seed. Apparently *A. Halimus* is more particular in the choice of soil than those now acclimatised, but on this point I should like more information.

During drought I have known cattle, horses, and sheep to browse and thrive upon these Australian fodder-plants, a most decided preference being given to them, although the surrounding ground was covered with other species of salt bushes.

In September 1889, I left for Parijs, in the Orange Free State, and took some of the seed with me. Each farmer on the route, *viâ* Hope Town, Kimberley, Boshof, Bultfontein, Kroonstadt, Vredefort and Parijs, received a small quantity to try; parcels were also sent to the Government Secretaries of the Orange Free State and the Transvaal, and various editors of newspapers.

The result was gratifying, for in a few months my father wrote to say that he had received quite a shoal of applications from the various districts I had passed through.

Up to this time we had been supplying seeds by post, 1*s.* per pound which included cost of collection, bag and postage: at 3*s.* 6*d.* per grain bag (say 20lbs.) 23*s.* 3*d.* per woolpack (say 150lbs.), and the same price obtains now.

The Agricultural Department was supplied with quantities as required, and I believe many farmers drew from that source, while others were referred to us for larger parcels. The publication of a letter I wrote to the Department in the *Agricultural Journal* led to an immediate increase in the demand. I am pleased to say that His Honour President Reitz of the Orange Free State interested himself and his Government in distributing the seed to such an extent that I had the pleasure of forwarding four woolpacks full to his government between January 1892 and January 1893. On inquiry I am informed by the Government Secretary that the seeds grew well, but that the locusts had done a great deal of damage during the past season (presumably to the *young* plants).

Mons. Geoff. St. Hilaire, Directeur du Jardin Zoologique d'Acclimatation, Paris, also applied for a supply of *A. Halimus*, which he proposed to acclimatise in the southern portion of Algiers. We sent him the three kinds; it would be very interesting to know the result.

Seeds were also supplied to Mr. Hermann, manager of a large company at Bethany, German South West Africa, who was quietly engaged in stocking that part of the country with merino sheep from our district, in order to provide an article of export. Mr. Steyn, residing at Bloemfontein on the western edge of the Kalahari Desert, has

taken a fair quantity for trial there, and I hope soon to hear the result.

EDWARD G. ALSTON.

24th March 1893.

Memoranda.

Number of seeds.—The number of seeds to a pound when dry is about 25,800 gross and 20,000 net (matured).

Time to sow.—Class of soil.—The seed may be sown at any time during the spring, summer and autumn months ; is not over particular as to class of soil, but prefers and grows most luxuriantly on moist brackish patches.

Mode of sowing. (*a*) *In the veld.*—To sow the seed broadcast in the veld is very wasteful and unsatisfactory ; the use of a spade or light hoe to lift the soil slightly, and inverting a thorny bush over the spot after sowing, is trouble well repaid. (*b*) *On old lands.*—When the object in view is to make use of old and worthless lands, they should be ploughed but not harrowed. The seed sown in small patches (say 50 yards apart), from half-an-inch to an inch deep, and well protected against sheep and cattle till the stem of the plant is too hard for them to eat. A light mulching of straw or similar material prevents too rapid evaporation, and in clay soils the pinching of the tender stem of the seedling. A fungus, I am told by Professor MacOwan, is likely to be the cause of a seedling dying sometimes. The spread of the bush on tilled ground is rapid ; hence the advice to sow small patches, a foresight which enables the farmer to look after it better and use less seed and water.

Drought and frost.—The plant stands drought and a minimum temperature of 14° as well as the Cape *Atriplex.*

Names.—It is an absolute necessity that the Australian salt-bush should be called by its proper name *Atriplex nummularia*, to prevent confusion if other salt-bushes are imported from Australia.

If an Australian were to apply here for seeds of a Cape salt-bush (meaning *A. Halimus*), he might receive "Aschbosch," "Inkbosch," "Zout Ganna," and possibly various kinds of "Kauwgoed."

EDWARD G. ALSTON.

Van Wyk's Vley.
Carnarvon, March 24, 1893.

Professor MacOwan writes in the *Agricultural Journal of Cape Colony* for May 18th, 1893 (p. 180) :—

" It is impossible to close this brief note without calling the attention of Cape agriculturists to the fact that they owe this magnificent addition to the food resources of their driest districts, ultimately, to the wise provision and generous care of Sir Ferdinand von Mueller, the Government Botanist of Victoria, who sent the seeds over here, and repeatedly pressed it upon our attention in the most earnest manner. Long since we owed to him the Eucalyptus gum trees, springing up by thousands where formerly trees were not. Now we are a second time indebted to him for a fodder plant, which is making its way as fast as did the ubiquitous blue-gum. I hope that in remembering Mr. Alston, as he richly deserves, we shall never forget Sir Ferdinand von Mueller."

South Africa itself, as will have been seen, is not destitute of native salt-bushes. One of these, *Atriplex Halimus,* L., reaches the South of Europe, and is cultivated in the Kew Arboretum. It is not unfrequently cultivated as a hedge plant in this country in the Isle of Wight, and elsewhere near the sea.

In the Report of the Cape Town Botanic Gardens for 1886, Professor MacOwan writes :—

"Perhaps the most noteworthy of the sale returns are the seeds of the salt-bushes, so prized by sheep farmers in Australia. These have attracted much notice among some of our colonists, and have been repeatedly asked for both through this garden, and directly from Government. We have, however, as I have reported to the Commissioner of Crown Lands, abundance of similar native plants of equal value, already well known to farmers, and capable of indefinite encouragement on brak land. Of these, *Atriplex Halimus*, L., the 'Vaal-Bosje,' is, perhaps, the best. *Kochia pubescens* and *K. salsoloides* are doubtless as good fodder, but their seeds are not conspicuous like those of the 'Vaal-Bosje,' and would be difficult to collect. I have recorded an instance of the 'Vaal Bosje' being multiplied on otherwise useless brak land by the simple process of scattering the seed on the occurrence of rain, and driving sheep over the surface to tread it in."

With regard to the relative merits as fodder plants of the Australian salt-bush (*Atriplex nummularia*) and the Cape salt-bush (*Atriplex Halimus*) the following analysis is published in the *Agricultural Journal of Cape Colony* :—In the last issue (Vol. VI. page 180), Professor MacOwan offers some remarks on an analysis of the Australian salt-bush (*Atriplex nummularia*). A comparison of the results there mentioned with those of an analysis of the Cape salt-bush (*Atriplex Halimus*) performed by us some time ago may possibly be of interest.

	Australian.	Cape.
Carbohydrates	42·85	63·37
Oily matter	2·18	—
Albuminoids	16·45	4·78
Woody Fibre	7·21	7·98
Ash	31·28	23·87

It will be observed that according to above results, the carbohydrates which constitute the fat-forming material *par excellence* in plants are more abundant in the Cape plant. The Australian salt-bush on the other hand contains a good deal more albuminoid, *i.e.*, nitrogenous or strength giving constituents.

Chas. F. Juritz, Senior Analyst.

A few other Australian salt-bushes belonging to the genus *Atriplex* may be briefly described :—

Atriplex halimoides, Lindl. A procumbent or diffuse under-shrub. Queensland to South Australia and gregarious over the greater part of the saline desert interior of Australia. Mueller describes it as "one of the best dwarf species for salt-bush pastures." Raised readily from seed. Cultivated at Kew.

Atriplex leptocarpa, F. V. Muell. A strong plant with a thick stock and herbaceous procumbent stems extending to 1 to 2 feet. The whole plant is more or less hoary or white with a scaly tomentum. East Australia. Mueller states :—Another of the perennial salt-bushes which render many dry and sterile tracts valuable for sheep pastures. It will

bear a great amount of drought, and if not too closely fed down produces seed in abundance." Seeds of this were distributed from Kew in May 1895.

Atriplex semibaccata, R. Br. Stems herbaceous, procumbent or prostrate, spreading to 1 or 2 feet. Queensland to West Australia. Mueller says :—" Very much liked by sheep, and considered among the best of saline herbage of the salt-bush country. Mr. Farrer pronounces this herb to be wonderful for its productiveness and its drought-resisting power."

This plant has proved most valuable in some of " the worst alkali spots " in California, single plants having reached a diameter of 16 feet in one season. " The yield of a full crop is about 20 tons of green material, or calculating on a basis of 75 per cent. water, 5 tons of dry matter per acre. A good season would permit of two such crops."

A further note (*Report of Agricultural Experiment Stations*, 1894-95, p. 320) states :—" It seems to be already demonstrated that this Australian species of *Atriplex* will constitute itself a most important industrial factor in this State, and will render productive vast tracts of land which are at present a blot on the landscape. . . . These tracts can be covered with salt-bush, and the resulting forage will aid greatly in maintaining domestic animals." The following chemical investigation of the fresh plant as grown in California has been made by Mr. M. E. Jaffa :—

Proximate analysis of the Australian salt-bush (*Atriplex semibaccata*) compared with some green fodders :—

——	Salt-bush.	Alfalfa.	Flat pea.*	Oat fodder.
Water - - - -	78·03	74·95	63·48	62·20
Organic matter - -	17·39	23·38	33·34	35·30
Mineral matter (ash) -	4·58	1·67	3·18	2·50
Totals - -	100·00	100·00	100·00	100·00

The following further account is taken from a Bulletin issued by the Agricultural Experimental Station of the University of California issued in November last.

" *Atriplex semibaccata*.—The past year's experience with this plant, both on the University station ground at Tulare and on the lands of scores of those furnished with seed or plants, shows that this plant has peerless adaptation for growth on soils too alkaline to support any other useful growth. So strongly are owners of alkali lands impressed with this fact that thousands of acres will be sown this winter. Enthusiastic correspondents write that the trial and announcement of the suitability of this plant are worth more to California than all the money the University Experiment Stations have cost from their beginning. The introduction of the plant to owners of waste alkali lands is certainly one of the most striking achievements in the University's long-continued policy of trial and distribution of economic plants. Bulletin No. 105, which will be mailed to all applicants, gives observations of the growth of the plant, hints for its culture, and investigations into its food value. Small plants set in alkali spots have attained a thick, matted growth,

* *Lathyrus sylvestris.*

16 feet in diameter in a single season. The crop, calculated on the basis of weighing the cut from a small area, should reach 20 tons of green feed, or 5 tons of dry from an acre, and probably two such cuts can be made each season. Three parts of this forage, mixed with one part of common hay, is readily eaten by horses and cattle. Sheep and hogs eat the green plant freely. The plant should be tried on alkali soils everywhere, in order that its climatic and other adaptations may be definitely determined. Plants may be grown by sowing the seed in boxes or garden beds, covering very lightly, and planting out the seedlings several feet apart, when a few inches high, on alkali spots. This is the surest way to get the plant established, although if the seed be scattered on the surface of the alkali soil before a rain, it germinates readily when the heat is adequate. When the plant once gets a hold on the soil, it covers the ground very thickly from self-sown seeds, which are produced in abundance. Seeds are sent at 5 cents per packet, post paid."

Professor MacOwan writes in the *Agricultural Journal of Cape Colony* for April 30th :—"It is worthy of note that Australian salt-bush is now plentifully advertised in Californian papers as "the special forage plant for alkali" soils. The species offered is *Atriplex semibaccata*, a near relative of the valuable *A. nummularia* which has been spread far and wide up country by the enlightened and unpaid agency of Mr. Edward Alston. It will astonish our Californian friends to hear that the salt-bush was actually petitioned against in a certain brack district of Cape Colony, and the Government was asked to class it along with burweed for extirpation because it spread so fast."

Atriplex vesicaria, Howard.—A bushy shrub covered with scaly tomentum. Central and South-eastern Australia. According to Mueller "One of the most fattening and most relished of all the dwarf pastoral salt-bushes of Australia, holding out in the utmost extremes of drought, and not scorched even by sirocco-like blasts. Its vast abundance over extensive salt bush plains of the Australian interior to the exclusion of almost every other bush except *A. halimoides* indicates the facility with which this species disseminates itself. Splendid wool is produced in regions where *A. vesicaria* and *A. halimoides* almost monopolise the ground for enormous stretches. With other woody species it is also easily multiplied from cuttings, but, as remarked by Naudin, it produces thousands of fruits in less than three months after sowing, and as stated by Millardet it has become (of late years since its introduction) the marvel of the Delta of the Rhone, in the South of France." (Cultivated at Kew.)

Other Australian salt-bushes are species of *Kochia*. In these the leaves are narrow and fleshy, sometimes half round. The fruits are surmounted with the almost flat membranous calyx with a winged border. This character easily distinguishes the Kochias from other salt-bushes. There are two Australian species of *Kochia* specially valued for fodder purposes.

Kochia eriantha, F. v. Muell. A stout shrub with the branches covered with a woolly tomentum. Mueller says :—"Proved an excellent fodder herb for sheep on the hot and dry pastures of Central Australia, where the temperature in summer reaches 120° F. in the shade, and in the winter falls 27° F. (Rev. H. Kempe). Several other Australian species of *Kochia* afford excellent pasture fodder.

Professor W. A. Dixon found 65 per cent. of digestible substance in *K. pyramidata.*"

Kochia villosa, Lindley. An under-shrub or shrub, erect, spreading, or decumbent, found in most of the depressed and saline regions of Australia particularly inland, also on sand lands. According to Mueller "renowned amongst occupiers of pasture runs as the 'cotton bush'; so called on account of the downy covering on the branches and leaves. This rather dwarf shrub resists the extremes of drought and heat of even the trying Central Australian climate. The roots sometimes penetrate into the ground to a depth of 18 feet (Lockh-Morton). With all other pasture animals dromedaries like this and some other salt-bushes, particularly for food; so also ostriches. These plants can be readily multiplied from cuttings."

Of *Rhagodia parabolica*, R. Br., Turner writes (p. 48):—"This shrub is found in the interior of Queensland, New South Wales, and South Australia, and usually in or near moist places, but is nowhere very plentiful. It is probably one of the best known of all saltbushes by stockmen, and on account of its mealy-white appearance they have given it the common name of 'Old Man Saltbush.' At one time this shrub was a prominent feature in many places in the interior, but of late years it is gradually becoming more scarce."

DXXII.—OSIERS.

The basket-industry appears to have decayed of late in this country, though there are some signs of a revival. Osiers are consequently no longer cultivated to the same extent as formerly. Basket-making is one of the most ancient of native industries and baskets the most primitive of appliances. Yet for many commercial purposes they remain superior to the modern and more civilized packing case. Being less rigid they will stand rough usage with less injury to their contents, and their toughness and strength enables them to endure a vast amount of wear and tear.

The following extracts are taken from a paper issued by the Board of Agriculture in 1893 on the "Cultivation of Osiers."

"There are no official records of the quantity of osiers imported into this country, but it has been estimated that some thousands of tons are received from abroad annually. There is also said to be a large and increasing importation of baskets. The number of baskets required for the fruit industry alone is considerable, and it must increase with the extension of fruit cultivation. Formerly the fruit was generally packed in baskets made of red or unpeeled osiers, but white osier baskets are almost invariably used now (p. 1).

"There can be no doubt that the extent of osier holts in the Fen district is now much less than it was, but at the present moment there is some evidence of increased interest in the subject and greater attention to the business. The industry is apparently becoming more of a speciality, and basket makers are planting holts in some instances to supply their own requirements" (p. 3).

The following correspondence relates to a request from the Government of Madras for a supply of cuttings of the willows esteemed by

basket-makers to the Presidency. It brought to light the curious fact that very little is accurately known about them, and that information is not readily procurable.

INDIA OFFICE to ROYAL GARDENS, KEW.

India Office, Whitehall, S.W.,
19th December, 1893.

SIR,

I AM directed by the Secretary of State for India to forward herewith a copy of a letter, and its enclosure, received from the Government of Madras regarding cuttings of certain varieties of osiers and sallows required for planting in that Presidency, and to ask you to be so good as to give instructions for the cuttings to be procured, properly packed and forwarded to the District Forest Officer, Nilgiris, Ootacamund, Madras, by any route you may consider most safe and expeditious.

All costs that may be incurred will be paid by this office.

I am, &c.
(Signed) A. GODLEY.

The Director,
Royal Gardens, Kew.

[Enclosure.]

GOVERNMENT OF MADRAS to INDIA OFFICE.

Revenue Department, Fort St. George,
7th November, 1893.

SIR,

I AM directed to forward a copy of the proceedings of the Board of Revenue, Land Revenue, on the planting of osiers and sallows in the swamps of the Nilgiri District, and to request that the Right Honourable the Secretary of State will be pleased to arrange with the authorities at the Royal Botanical Gardens, Kew, for the transmission to the address of the District Forest Officer, Nilgiris, Ootacamund, of cuttings of the varieties referred to in the list attached to the collector's letter. The size of the cuttings, and a description of the manner in which they should be packed are given in the collector's letter.

I have, &c.
(Signed) R. GIBSON,
Acting Secretary to Government.

The Assistant
Under Secretary for India,
London.

ROYAL GARDENS, KEW, to INDIA OFFICE,

Royal Gardens, Kew,
7th February 1894.

SIR,

I HAVE the honour to acknowledge the receipt of your letter of December 19, asking that cuttings of certain specified varieties of osiers and sallows might be obtained for transmission to the District Forest Officer, Nilgiris, Octacamund, Madras.

2. Compliance with this request has not been easy, as the cultivation of willows appears to be a decaying industry in this country, and considerable difficulty has been experienced in finding a person who would

supply cuttings of the particular kinds desired. These are known by merely technical names, which have not been identified botanically.

3. It has now, however, been accomplished, and a box containing 15 kinds of osiers has been this day despatched to the India Office. It should be forwarded to India with the greatest despatch, and instructions should be given that it should be placed in a cool part of the hold (but not in a cool chamber). Precautions should also be taken to prevent its being unduly delayed at the port of arrival.

I am, &c.

(Signed) W. T. Thiselton-Dyer.

Sir Arthur Godley, K.C.B.,
India Office, Whitehall, S.W.

Royal Gardens, Kew.

A list of osier cuttings sent in a close case, per India Office, to the District Forest Officer, Nilgiris, Ootacamund :—

No. on Label.	Trade Name of Osier.
1	Black Hollander.
2	Black Mauls.
3	Welsh Osier.
4	French Osier.
5	Glibskins.
6	Green Sucklings.
7	Jelstiver.
8	Mottled Spaniards.
9	Cane Osier.
10	Cardinal Osier.
11	Old Black, new kind.
12	Golden Osier = *Salix vitellina.*
13	Fine basket Osier = *S. forbyana.*
14	Green boxed = *S. rubra.*
15	Spaniard Rod = *S. triandra.*

Numbers 1 to 8 are used for best work in baskets, &c. Numbers 9 to 12 are used for rough work, such as baskets for fruit, potatos, &c.

February 7, 1894.

District Forest Officer, Nilgiris, to Royal Gardens, Kew.

Nilgiri Collector's Office, "Forest Branch,"
March 30th, 1894.

Dear Sir,

The osier and sallow cuttings sent by you through the India Office, arrived here on the 21st instant in excellent order, and were at once planted out. The buds had all burst, and the cuttings were well rooted and healthy. I trust they will prove a success here.

I am, &c.

(Signed) R. W. Morgan.

W. T. Thiselton-Dyer, Esq., C.M.G., C.I.E.,
Director, Royal Gardens, Kew.

Besides the paper already referred to, issued by the Board of Agriculture, which contained valuable statistics and much information respecting methods of cultivation, &c., a paper on "The Cultivation of Osiers as a Means of Utilising Boggy Land," by W. J. Cochrane, Glenside, Hetton-le-Hole, Fence Houses, Durham, was also published in 1893, in the "Transactions of the Highland and Agricultural Society of Scotland." In the latter, botanical names are given, and the statements in the following extract (p. 132) are definite enough :—

"If basket-work is the main use to which they are to be put, perhaps the best kind is the common white willow, *Salix alba*, which grows fast and attains a large size, yielding tannin and salicin, while, in addition to its utility for basket-making, its wood is suitable for wattles, fuel, and chip. The common willow, *Salix viminalis*, is a very good osier for general purposes, being suited alike to rough and to delicate work; while a taller variety, the long-leaved willow, *Salix triandra*, growing to a height of 20 feet, is one of the most useful of all willows. Amongst others I would mention *S. rubra* and *S. laurina*: whilst if the substance salicin, obtained from the bark and used for medicinal purposes, is wanted, the species *S. fragilis*, or the crackling willow, is is be recommended as being the richest in this substance, and at the same time yielding a fair amount of very good timber."

On the other hand, in the Board of Agriculture pamphlet technical names are used, and it would appear from correspondence on the subject, that these names are limited to certain districts. In order to determine botanically, the different osiers bearing these local names, cuttings of a dozen kinds, were obtained from Mr. R. Brown, Somersham, Hunts, a practical osier grower; these have now flowered, and have been been definitely determined.

1.	Glibskins	*Salix triandra*	♀
2.	Jelstiver	" "	♀
3.	Black Hollander	" "	♂
4.	French osier	" "	♂
5.	Old black, new kind	" "	♂
6.	Green sucklings	" "	♂
7.	Black Mauls	" "	♀
8.	Cardinal willow	*Salix alba*, var.	♀
9.	Golden osier	*Salix viminalis*	♂
10.	Cane "	" "	♀
11.	Welsh "	*Salix purpurea*	♂
12.	Mottled Spaniards	*Salix decipiens*	♀

(*S. decipiens* is very nearly allied to *S. fragilis* and is placed as a mere form under that species by many authorities; others regard it as a hybrid.)

According to Mr. Brown Nos. 1, 2, 3, 4, 6, 7, 11, 12, are the best for basket making (for the best class of work) while Nos. 5, 8, 9, and 10 are for rougher work such as gardening baskets (for potatos, fruit, &c.).

DXXIII.—WILD COFFEE IN BRITISH CENTRAL AFRICA.

Sir Henry Johnston, K.C.B., Her Majesty's Commissioner in British Central Africa, published in the *British Central Africa Gazette* for October 15th last, the following account of a presumed wild coffee in

Nyasaland. The plant, however, on examination at Kew, proved to belong to a different tribe of Rubiaceæ to *Coffea*. It appeared to be a plant hitherto unknown and was described by Mr. Hemsley in the *Kew Bulletin* for January last (p. 18) as *Cremaspora coffeoides*. The genus comprises but a few species all confined to Africa and adjoining islands.

The Commissioner's account is subjoined :—

On his recent journey to the Mlanje district, Her Majesty's Commissioner made an interesting discovery. In the valley of the little Nyungwi stream, which flows direct into the Ruo about 10 miles west of the confluence of the Likubula and the Ruo, and close to the place where the Nyungwi is crossed by the main road to Fort Anderson, the Commissioner found growing a species of wild coffee apparently identical with that which is met with in the interior of Moçambique, on the Zambesi, and at Inhambane. By a happy chance this wild coffee was not only in blossom, but bore the ripe berries at the same time. In growth the tree was very straggling, and somewhat resembled the original cultivated coffee tree in the Blantyre Mission grounds. This wild coffee was found growing for several hundred yards along the banks of the stream. The Commissioner collected a large number of the berries, some of which were ripe, and these will be planted in the gardens at Zomba. Specimens were also collected of the leaves, flowers and fruit for transmission to Kew for identification.

It has generally been stated by the Commissioner himself amongst others, that there is no wild coffee indigenous to Nyasaland, and certainly up to the present discovery it was believed that no specimens of the wild coffee had been found by anyone. The Commissioner searched diligently in almost all the other stream valleys that he crossed in the Mlanje district for other specimens of the wild coffee, but was not able to find any.

It is just possible that these trees found on the Nyungwi stream close to the Portuguese border might have had their origin in seeds of the wild Zambezi coffee accidentally conveyed there. At the same time, seeing that coffee is indigenous to tropical Africa, and is found in almost all the warm parts of the continent which are not absolute deserts, it is very extraordinary that a fertile region like Nyasaland should almost alone possess no form of indigenous coffee. The Commissioner therefore desires us to publish this discovery for the information of planters and others who, by careful investigations, may succeed in discovering a wild indigenous coffee in the British Protectorate. Meantime he has no objection to the berries of the wild coffee growing on the Nyungwi stream (which is on Crown land) being gathered by any persons who may like to try the experiment of planting this wild coffee.

DXXIV.—SOUTH NYASALAND.

The British Central African Gazette for December 15 last, gives under the title of Zarafi's country, the following interesting account of a recently opened district in South Nyasaland :—

This may be defined as a triple range of hills running in a north-easterly direction from the middle of Lake Chilwa to the south-east gulf of Lake Nyasa. There is first a low range of foothills commencing about 20 miles to the north of Lake Chilwa and running nearly parallel

with the shore of Lake Malombe; then a great hog's-back culminating in Mangoche Mountain and the Castellated Hills, and to the east of the main range a broken series of more or less high mountains (Usui, Lisamba, Unangu, Lipelele). Further to the east are many isolated mountains in Portuguese territory dotting the Lujenda plain.

Until the recent expedition, no European had ever set foot in Zarafi's country proper, that is to say, on Mount Mangoche, which is a long range about 14 miles in length, including the Castellated Hills, and four miles broad: not of course, quite isolated, but connected with other ranges, north and south, by outlying spurs. The culminating point of Mangoche is approximately, 5,500 feet above the level of the sea, or about 4,000 feet above the level of Lake Nyasa. To the north of the highest point of Mangoche the mountain slopes rather abruptly to a pass about 1,200 feet below, which is a flattened ridge sloping with undulations into the Lujenda valley on the one side and more abruptly on the other into the Malombe plain. In the centre of this flattened ridge, which is a veritable gate into Central Africa from the east coast, is built Zarafi's town. At the northern end of this remarkable pass rise the two Castellated Hills—extraordinary pyramids of tremendous rounded rocks or boulders, nearly equal in height to Mangoche Mountain. Between these Castellated Hills a steep pass descends to the north-west into a lovely fertile valley through which a road leads over the western range of foot-hills down to the Upper Shire and Lake Nyasa. From the summit of Mangoche Mountain looking down over the pass whereon Zarafi's town is built, north-west from the two Castellated Hills, the arrangement of the mountains bears a fantastic resemblance on a gigantic scale to the head of some colossal extinct two-horned rhinoceros (such as there were in times past), which bore the horns transversely on the end of the nose and not longitudinally as do the existing species. The crest of Mangoche would be the crest of the animal's skull, the flattened pass in which Zarafi's town is built the curious depressed frontal bones of the rhinoceros, and the two Castellated Hills the transverse horns on the end on the snout.

There is probably no place in the Protectorate built on such an almost impregnable site, and with such commanding views as Zarafi's. Although flat and pleasant for walking on the summit of the pass, the ascents on the east, west, and north are abrupt and narrowed into gorges which a few resolute men could easily block. On the south is the crest of Mangoche Mountain, from which the place could be easily shelled by European artillery, but which would offer no advantage to savage warriors, as Zarafi's town would be quite beyond range from these heights. Another feature which adds to the impregnability of this natural fortress is the ample water supply. Not only do four streams take their rise within a circuit of a mile and a-half of Zarafi's town, but two of these streams rise from springs actually at the top of the pass in the centre of the town, and one of them affords pure cold drinking water, whilst the other is suitable for washing purposes, though it, too, could be made perfectly drinkable by protecting the source from defilement. In the first valley to the east of Zarafi's town and about 100 feet below is a beautiful rushing stream full of water, even at the very end of the dry season. The pass has, however, been greatly denuded of trees—not, we think, because of any action of the wind, but simply by the usual vandalism of the Yaos. Such trees as remain in or near the town grow well—in fact, one of these trees at the end of the town is a landmark for miles, and can be easily seen from Fort Johnston, 20 miles away. If the town is replanted extensively with shady trees the only

disadvantage at present existing will be removed, viz., its wind-swept condition, and the glare in bright sunshine caused by the want of shade. Both this pass and the surrounding mountains are strewn with boulders in the most extraordinary manner, and all of them rounded and not jagged. Some of these stones are gigantic monoliths set on end like Stonehenges, others are mighty recumbent rounded masses of stone. Between the boulders the soil is very fertile, and where it does not grow food crops it is covered with short grass or luxuriant herbage and wild flowers. All the other parts of Mangoche Mountain are clothed with dense forest, many of the trees being of fine growth. Below this forest are strips of greensward and below this again the mountain side is strewn with gigantic boulders as though they had been scattered by some giant's hands. Mangoche Mountain—indeed, the whole Mangoche range—is a regular sponge as regards issuing streams and fountains; and this, too, at the very end of the dry season. The scenery is beautiful, and the views from Zarafi's pass are most comprehensive. From here the eye ranges over the valley of the Lujenda river, and on a clear day the narrow slit-like lake of Chiuta can be descried (this lake really looks like a very long broad river). Turning to the south-east, one can see the ranges of Zomba and Chikala (round the side of Mangoche), the Upper Shire from near Mpimbi to its entrances into Lake Nyasa (the broad sweep of water in Lake Malombe is most effective—like a great silver crescent set in a blue plain), and, looking to the north-west, the whole of the south-eastern shore of Lake Nyasa up to Cape Maclear can be followed. Due west on a clear day, the mighty Angoni plateau, rising to 7,000 feet and perhaps higher, looms like some distant land suspended in the heavens. For a watchful robber chief there could be no finer site chosen, for, except in very hazy weather, all roads leading from the plains up to his pass could be watched. On a clear day the houses at Fort Johnston can be easily made out together with the gunboats at the south end of the lake or the river side. As the crow flies it is possible that Fort Johnston is not more than 18 or 19 miles distant, though by the road it is at least 24.

The altitude of Zarafi's town is about 4,250 feet above the sea or 2,750 feet above the level of the Upper Shire. It is consequently a very cool place at night time and probably in the winter season would be distinctly cold. It ought to be healthy, except for the high winds, and it is certainly swept by all the winds of heaven though down below in the gorges there are plenty of sheltered places protected from these unwelcome breezes. For a European settlement we should think that the western flanks of Mangoche Mountain might be preferable to the eastern, as less exposed to the wind. Here there are thousands of acres of virgin soil on the skirts of the fine forest, with an abundant water supply, and at average altitudes of 4,000 feet above the sea.

If only for scenery this portion of the South Nyasa District deserves a visit. It is now perfectly safe to travel to Mangoche, and Captain Cavendish, who is in command of Zarafi's town, would be happy to receive visitors and show them the wonders of the place. To those fond of picturesque scenery we would recommend the path which skirts the western side of Mangoche Mountain. The scenery, on a much larger scale, resembles "The Valley of the Rocks" at Lynton on the North Devon coast. The path keeps pretty much on a level and is easy walking. Above towers the forest-crested ridge of Mangoche, and below, the eye ranges over remarkable rocky spurs, green gorges, and this extraordinary jumble of boulders, some standing on end, some prone, which we have already sought to describe.

DXXV.—MISCELLANEOUS NOTES.

Mr. Charles Berryman, a member of the gardening staff at Kew, has been appointed Acting-Curator of the Botanic Station at Aburi, on the Gold Coast, during the absence on leave of Mr. C. H. Humphries, the curator. Mr. Berryman left Liverpool for West Africa on the 13th June last.

Mr. John Henry Holland, a member of the gardening staff of the Royal Gardens, has been appointed, on the recommendation of Kew, by the Secretary of State for Foreign Affairs, Assistant Curator of the Botanic Station at Duke Town, in the Niger Coast Protectorate. He left Liverpool for Old Calabar in the middle of June last.

Mr. William Bernice French, a member of the gardening staff at the Royal Gardens, has been appointed assistant at the Municipal Gardens at Queenstown, South Africa. Mr. French had been a sub-foreman in the orchid-houses and the Palm-house for the last three years. He entered Kew in August, 1891, and had previously served in the garden of the late Sir George Macleay, at Bletchingley. He left for South Africa in June last.

Mr. Henry Millen, the curator of the Botanic Station at Lagos, has arrived at home on leave of absence. He has been in the service of the Lagos Government since 1890. During his absence the duties at Ebute Metta will be discharged by Mr. F. G. R. Leigh, acting curator, while Mr. T. B. Dawodu will be in charge of the Gardens attached to Government House. Messrs. Leigh and Dawodu are both natives of Lagos and received horticultural training at the Botanical Gardens, Jamaica (1890–93) and afterwards at Kew (1893–94).

It will be a matter of deep regret not merely to the Government of the colony, which he has served so well, but also to the botanical world, that Dr. Trimen was obliged, owing to serious ill-health, to retire on July 1 last from the post of Director of the Royal Botanic Gardens, Peradeniya, in Ceylon. Dr. Trimen, who was at the time second officer in the Botanical Department of the British Museum, was appointed on the recommendation of Kew to succeed the late Dr. Thwaites in 1879. His administration of Peradeniya, whether from a practical or a scientific point of view, has brought it into the front rank of the great botanical establishments of the world. On this point the following extract may be quoted from an article by Dr. Treub, the Director of the Great Botanic Garden of the Dutch Government at Buitenzorg in Java. This article, originally published in the *Revue des Deux Mondes* for January last, has been translated in the *Smithsonian Report* issued from Washington

Extract from "A Tropical Botanic Garden," by Dr. Treub, in *Smithsonian Report* for 1890, p. 390.

"The Royal garden of Peradeniya, in the island of Ceylon, was founded in 1821. Situated near Kandy, at an altitude of nearly 500 metres [1,600 feet], having a moist and hot climate, occupying more than 60 hectares [150 acres], and connected as it is with the port of Colombo by a railway, the garden of Peradeniya possesses conditions most

favourable in every respect. For many years it was under the direction of Dr. Thwaites, a man of real merit, but who thought a botanic garden in a tropical country should be in some manner a reduced copy of the virgin forest. This system, more original than meritorious, excludes any methodical arrangement of plants and necessarily restricts the number of specimens. Dr. H. Trimen, the successor of Dr. Thwaites, as soon as he arrived in Ceylon, realised the disadvantages of the plan of his predecessor. To distribute over an area of 60 hectares, without any order, a great number of plants, for the most part not labelled, was to fatally embarrass the scientific use of the rich collections that had been brought together. So Dr. Trimen did not hesitate to adopt a new arrangement of plants according to the natural system, and to label them as far as it was possible to do so. With branch establishments upon the plain and upon the mountain, the garden of Peradeniya has before it a brilliant future.

Dr. Trimen has not merely carried out a most efficient and thorough reorganisation of his department, but he has signalised his term of office by the production of three volumes accompanied by an atlas of plates of the long-desired *Handbook of the Flora of Ceylon.* (For notices of these volumes, reference may be made to the *Kew Bulletin* for 1894, pp. 34 and 227, and 1895, p. 236.) A final volume alone remains to complete this invaluable work. It is satisfactory to record that Dr. Trimen has been "given by the unanimous vote of the Legislative Council a special allowance in addition to his pension for the last six months of the year in order to complete the scientific work upon which he is now engaged."

As one of the founders of the colony of British Central Africa; as a most successful pioneer in its agricultural development and as an active promoter of the botanical investigations of its flora, JOHN BUCHANAN, C.M.G., who died on his way home on March 9th, deserves a record. He first went to Africa in 1876, in the service of the Church of Scotland Mission, and soon, without any practical knowledge, became a planter of coffee, sugar, and tobacco, and in building up a large and successful business for himself he assured the future of the colony in industrial enterprise. A reference to Sir Henry Johnston's report on this subject, reprinted in the *Kew Bulletin*, 1895, p. 190, will give some idea of the extent of his operations. Like many busy men, he found time to do many things. In 1892 he transmitted a large collection of dried plants to Kew. It comprised about 1,500 numbers; most of them being represented by several specimens. Sets of this collection were distributed to eight of the principal herbaria of the world. Many of the novelties have been published in the *Kew Bulletin*, and in *Hooker's Icones Plantarum*, and many still remain undescribed.

Although not one of the pioneers in British Central Africa, ALEXANDER CARSON laboured hard and successfully in developing the resources of the colony; and he, like Buchanan, contributed largely to our knowledge of its vegetation. From time to time he sent dried plants to Kew through Mr. R. Kidston, of Stirling. Altogether these formed a large collection, including numerous novelties, many of which have been published in former volumes of the *Bulletin*,

notably in 1895, pp. 63–75 and 288–293. A few have also appeared in *Hooker's Icones Plantarum.*

The following particulars of his career were furnished by his brother, Mr. Thomas Carson :—

Alexander Carson was born at Stirling, N.B., in the year 1850, and was educated at the High School there. Following his natural bent he served an apprenticeship in one of the Clyde Marine Engineering Works, and thereafter sailed as engineer on one of the Cunard Company's Mediterranean steamers. Being of a studious disposition, the routine duties of a ship engineer soon became distasteful to him, and having resigned his situation he entered Glasgow University with the view of qualifying himself for better work. Having taken the degree of B.Sc. in 1883, he was for some time employed in Glasgow engineering offices. In 1886 he accepted an appointment under the London Missionary Society for service at Lake Tanganyika. Having fitted up the engines of the steamer "Good News," and having seen this, the first steamer on the lake, fairly at work, the immediate object of his appointment was accomplished. His time was now devoted to teaching the natives the various industries, which his education qualified him to do, work in iron (in which the country abounds) being foremost. He also took an active part in educational work.

In 1888 the Arabs of Ujiji menaced the lives of the missionaries on the lake shore, and access to the coast being cut off both by the Zanzibar and Nyasa routes all communications with and supplies from home were stopped for over a year. After five years' work he enjoyed the customary twelve months' furlough, resuming his work in 1892. The scene of his work was now at Fwambo, a native village some 50 miles south of Lake Tanganyika, some thousands of feet above sea-level. Under his management much improvement has been made in the physical condition of this village; industry has been fostered, the general habits of the people have been improved, and many hundreds of the young have received the rudiments of education, while religious teaching has not been neglected.

For many years his health was fairly good; last year, however, an attack of hæmaturic fever proved nearly fatal, but recovering, he was able to resume his work for another year. Then came a second and a third attack of the same disease, under which he sank from sheer weakness on February 28 of the present year.

Botanical Magazine for June.—The plants figured are: *Agave laxifolia*, *Habenaria Elwesii*, *Phajus mishmensis*, *Eranthemum reticulatum*, and *Episcia densa*; all, except the *Habenaria*, from plants grown at Kew. The *Agave* has been cultivated here for many years, and flowered for the first time in 1895. It is a native of Mexico. *Habenaria Elwesii*, native of the Nilghiri Hills, was communicated by H. J. Elwes, Esq., F.L.S., in whose garden it flowered in July 1895. The *Phajus* figured is a native of the Eastern Himalaya, and was discovered by William Griffith in 1836. The Kew plant was presented by the Right Hon. the Earl of Scarbrough, who collected it himself. *Eranthemum reticulatum*, a fine ornamental plant, has been long in cultivation. It is probably a native of the Melanesian Islands. *Episcia densa*, native of Demerara, was sent to Kew by Mr. Jenman, Government Botanist and Superintendent of the Botanical Gardens of Georgetown, British Guiana.

Botanical Magazine for July.—All the drawings were made from plants in cultivation at Kew. They are: *Lourya campanulata*, *Pilocarpus Jaborandi*, *Aspidistra typica*, *Akebia lobata*, and *Hæmaria dawsoniana*. The *Lourya* is a curious plant, native of Cochin China, with the habit of *Curculigo* and *Peliosanthes*. The subject of the figure was obtained from a French nursery in 1892. *Pilocarpus Jaborandi*, native of Pernambuco, was received from the Cambridge Botanic Garden, and flowered at Kew in January of this year. The plant is interesting on account of its powerful medicinal properties. The *Aspidistra* is a native of Tonkin. The plant from which the drawing has been made was obtained from the Jardin des Plantes, Paris, in 1895. *Akebia lobata*, native of China and Japan, flowered in the greenhouse at Kew in January of the present year. The *Hæmaria*, a native of Burma, was communicated to Kew from the Royal Botanic Garden, Calcutta.

Hooker's Icones Plantarum.—The concluding part of the fifth volume of the fourth series appeared in July. It consists of plates 2476 to 2500 of the entire work, and the first nine plates are devoted to the illustration of West Tropical African species of *Amomum*, chiefly collected by Mr. Gustav Mann, between 1859 and 1862. *Trachymene cebecia* is a handsome species of this essentially Australian genus from the Celebes. It is most nearly allied to *T. saniculæfolia*, a native of Mount Kinabalu, North Borneo. Two tuberous-rooted species of *Plectranthus* are figured. They are natives of Natal, where several other species of this section grow, and where their tubers are esteemed as food by the Kaffir inhabitants. *Stenolirion* (Amaryllideæ); *Garnotiella* (Gramineæ); and *Batesanthus* (Asclepiadeæ) are new genera: the first and last tropical African, and the grass from the Philippine Islands.

Flora of British India.—A note in the *Kew Bulletin* for 1894 (p. 225) records the fact that the elaboration of the difficult order of grasses only remained to complete the enormous labour undertaken by Sir Joseph Hooker in preparing the *Flora of British India*. This, the crown of the edifice, was perhaps of all the most difficult of achievement. The publication of a first part of Volume VII., which contains the whole of the *Panicaceæ*, will be hailed therefore by all botanists with as much satisfaction as admiration.

The following extract from Sir Joseph Hooker's brief introduction to the order gives some idea of the difficulties with which he had to contend. They are probably unique in any part of the vegetable kingdom, at any rate as far as flowering plants are concerned:—

"In working up the grasses for this Flora, I find the multiplication of species to have passed all bounds, and their nomenclature to be involved in a corresponding degree. This has arisen from two principal causes, from authors not taking into account the wide area over which the individual species of grasses range, and from the imperfection of the descriptions of the earlier and many later authors. It is sixty-two years since Kunth published his "Agrostographia Synoptica" (Tubingen, 1833); which is an uncritical sweeping up of all previously known supposed genera and species, with imperfect descriptions and synonyms. It was succeeded (in 1835) by a second volume, in which a few hundred species of the first volume are very fully and accurately described, and valuable notes upon others are added. In 1855 Steudel's "Synopsis

Graminum" appeared. It in no respect advances, and in many ways retards, the student of the Order. Of more recent works on *Gramineæ* three only are of great mark, namely, Munro's very able monograph of the *Bambuseæ* (Trans. Linn. Soc., vol. xxvi., 1868); Bentham's revision of the genera, Gen. Plant., vol. iii. (1883), a work of remarkable completeness and accuracy, considering the chaotic condition in which the author found the Order; and Hackel's admirable monograph of the *Andropogoneæ* in A. de Candolle "Monogr. Phanerog." vol. vi. (1889), the largest and most difficult tribe of grasses."

It is doubtful if any living botanist could have brought to the task the extraordinary power which Sir Joseph Hooker possesses of dealing with an immense mass of confused and complicated detail and of arriving at clear and definite conclusions from them. To Dr. Stapf, a member of the Kew staff, the duty was assigned of assisting Sir Joseph Hooker in the more laborious portion of his task. To the efficient aid which he rendered Sir Joseph Hooker pays a compliment as charming as it is deserved.

Distribution of Alpine Plants.—The Linnæan Society has published in its *Transactions* the elaborate tables showing "The Distribution of Plants on the south side of the Alps" prepared by the late John Ball, F.R.S., Under Secretary of State for the Colonies from 1855–7. The work of preparing them for and passing them through the press has been done at Kew. The following extracts from the "Introductory Note" contributed by the Director will show the nature of the task which Mr. Ball set himself. The result cannot fail to be of the greatest service for the study of the problems presented by the Alpine Flora, which are amongst the most interesting of those presented by the vegetation of any part of the earth's surface:—

The late Mr. John Ball, F.R.S., as is well known, devoted a considerable portion of a very varied life to the minute study, both topographical and scientific, of the European Alps. The results of the former were embodied in a book, which, in its way, will, I suppose, always remain a classic, the well-known "Alpine Guide." Those of the latter he never published in a comprehensive form, though he drew from time to time for occasional papers upon the records which he had patiently accumulated for a period of about 30 years.

Mr. Ball died on October 21, 1889, somewhat unexpectedly, after a brief illness. Some time afterwards his widow placed in my hands his botanical papers in the hope that I might be able to extract from them something of permanent value which would record his long and patient labours upon the Alpine flora. The task was no easy one, and I think I should have shrunk from it without the encouragement of Mr. G. C. Churchill, the best surviving authority in the country on the subject, and of Mr. J. G. Baker, F.R.S., the Keeper of the Kew Herbarium. As the result, I found that practically the whole of Mr. Ball's work on the flora of the Alps is concentrated in the elaborate Table of the Distribution of Plants on the South Side of the Alps which is now submitted to the Society.

The precise nature of the task which Mr. Ball set himself, is described in a lecture "On the Origin of the Flora of the European Alps," which he delivered before the Royal Geographical Society on June 9, 1879. It will be best given in his own words:—

"More than 20 years ago I began to tabulate the plants of the Alps, so as to show the distribution of each species within the range of the

Alps and on the other mountains of Europe. As the southern side of the main chain has the richest and most varied flora, and was at that time the less fully known, I divided it into 50 districts, and set myself to collect materials from published works, from public and private herbaria, and mainly from my own repeated visits—this part of my work involving, in fact, the preparation of 50 local floras. Though I regard the work of botanical exploration as yet far from complete, I in this way accumulated a great mass of materials, and the question then arose as to what conclusions should be drawn from them." (Proc. R. Geogr. Soc., 1879, p. 565.)

It will be seen that what Mr. Ball accomplished, and, so far as it is possible to judge, in a tolerably exhaustive manner, is to work out the detailed distribution of the Alpine flora for 50 easily recognisable districts on the same principle as that adopted with such conspicuous success by Mr. H. C. Watson for the flora of Great Britain in his well-known "Cybele Britannica."

I learn that during the last few years of Mr. Ball's life, partly from failing eyesight, partly from other causes, he had worked but little at the table, though he always regarded it as of great importance. I do not know that this materially diminishes its value. It is obvious that no work of the kind can ever be absolutely final.

Pictorial Aspect of Kew.—The fine series of views of the Lake in the Kew Arboretum and its vicinity, the work of M. and Mme. de L'Aubinière, were referred to in the *Kew Bulletin* for last year (p. 303) when a selection from them was placed on exhibition in the North Gallery. The talented artists have now had 21 of the most characteristic engraved by Count Ostrorog, and published in a volume entitled "The Poetry of Kew Gardens," of which Her Majesty the Queen has been pleased to accept the first copy. At their request the Director furnished the following preface:—

"Visitors to Kew who admire its stately trees, its sylvan glades, and its spacious lawns, probably in most cases suppose that Nature endowed it with its charms. But this is far from being the case. Kew throughout is the creation of the art of the gardener applied continuously for a century and a half, and never even at the present day ceasing to modify, develope, and refine.

"Landscape gardening, as exemplified in such a domain as Kew, is peculiarly English. It originated, no doubt, partly in an intelligent appreciation of the possibilities afforded by the climate, which allows smooth turf to grow in a manner unknown in other countries, partly in the demand for giving to country mansions harmonious and sympathetic surroundings. Its evolution has been gradual, and it is not without interest to notice that Kew has been the scene of the earliest attempts of its successive masters.

"English gardens down to the end of the sixteenth century were ordinarily walled enclosures laid out with extreme formality. They were adjuncts to the dwelling-house, and shared its defensive protection against disorder. The gardener stayed his hands at the limits of his boundary.

"Though in the next century walls gave way to hedges, the treatment of the garden still remained formal. The stately methods of the great French landscape gardeners were bodily transported to England at the Restoration. They were, it may be admitted, well suited to

splendid pageantry and a grandiose mode of life. But they were only adapted to large domains, as they sought to bring the surrounding park into connection with the garden by the plantation of extended avenues. This extension was the germ of landscape gardening proper. But the defect of the system was that its interest was almost exhausted at a first impression and its monotony soon became wearisome.

"The beginning of the eighteenth century saw a violent reaction against the formal style. This was largely due to the influence of Pope and Addison. Switzer was the first to introduce 'rural gardening.' The object was to connect the garden with its natural surroundings without the stiff and costly methods of Le Nôtre.

"Bridgeman at about the same time went even further. In the Royal Garden at Richmond (now incorporated with Kew) he 'dared to introduce cultivated fields, and even morsels of a forest appearance.'

"Kew, as it exists to-day, was formed by the fusion of two distinct properties or domains, both royal, but with entirely different histories. They corresponded roughly to the west and east halves of the present gardens. The western half was known as Richmond Gardens (or the Royal Garden at Richmond). The eastern half corresponds in great part to the grounds of Kew House, and to this the name of Kew Gardens was originally confined. The two properties were separated by Love Lane, the ancient bridle-road between Richmond and Brentford ferry. This was shut up and the two properties thrown together in 1802.

"Frederick, Prince of Wales, the father of George III., obtained in 1730 a long lease of Kew House. Sir William Chambers, who erected the Pagoda, the Orangery (now Museum No. III.), and other buildings, many of which have not survived, gives a description of the eastern half of the gardens in the middle of the last century.

"'The gardens of Kew are not very large, nor is their situation by any means advantageous, as it is low and commands no prospects. Originally the ground was one continued dead flat, the soil was in general barren, and without either wood or water. With so many disadvantages, it was not easy to produce anything tolerable in gardening; but princely munificence, guided by a director equally skilled in cultivating the earth and in the polite arts, overcame all difficulties. What was once a desert is now an Eden.'

"The task could not have been easy. But there seems reason to believe that in the main features which still survive it was the work of Kent, who has been termed the 'founder of the school of landscape gardening.' By the introduction of the sunk fence or ha-ha (largely used at Kew) instead of walls or fences, he brought external scenery into his landscape effects.

"An even more celebrated practitioner of the art, 'Capability Brown,' was employed by the Dowager Princess of Wales to remodel the western half of the gardens. A pretty clean sweep was made of the 'rural gardening' of Bridgeman. Brown's entire plan, which included the erection of a new palace, was never carried out. But Kew probably owes to him the beautiful Hollow Walk, now devoted to rhododendrons, which according to local tradition was made about the middle of the last century by the Staffordshire militia while quartered at Kew.

"For the greater part of a century after this Kew remained comparatively untouched. After the accession of Her Majesty to the throne it was determined to devote it to the purposes of a national botanic garden.

"Sir William Hooker was appointed the first director, and assumed office on the 1st of April 1841. The part then opened to the public was

only the original Botanic Gardens of about 15 acres. The remainder had lapsed into the condition of a wilderness, and was used as a game preserve by the late King of Hanover.

"By slow degrees the ground accessible to the public was increased, and in 1850 the whole of the 'pleasure grounds' were thrown open. Sir William Hooker found himself in charge of a spacious area, in many parts thickly wooded and overgrown, but devoid mostly of distinctive features or picturesque effects. The problem which he and his successors have had to face was how to treat this so as to convert it into a beautiful garden after the English plan, and yet utilise it for the scientific purposes to which it had been devoted.

"The plan adopted was that which has been customary in the treatment of great domains in this country in more recent times. It combines something of the more ancient practice with a free employment of that which succeeded it. The formal treatment which is still needed to harmonise gardening with architectural effects blends insensibly with the naturalistic which is most appropriate at a distance. Formality has neither been carried into the landscape with Le Nôtre nor banished altogether with Kent and Brown. When large buildings—the Great Palm House, the Winter Garden, the New Museum, and the Water Tower—were erected for the new purposes to which Kew had been devoted, the ground immediately adjacent to them was laid out under the advice of Nesfield in a strictly formal and stately way. To him are also due the long vistas which stretch away into the pleasure grounds, now the Arboretum. The more distant portions have been gradually remodelled, the aim being to weave the various collections of trees and shrubs into a whole which should avoid an artificial, and yet yield an agreeable effect, while still subserving a definite purpose. It can hardly be doubted that the result has been successful, and that it is possible to construct a great botanic garden which shall sacrifice nothing to its object, and yet be neither arid nor ugly.

"The lake at the southern end of the Royal Gardens, like every other picturesque feature which they contain, is of entirely artificial origin. It is difficult perhaps now to realize that the ground it occupies was once as flat as the rest. The lake was commenced about 40 years ago by Sir William Hooker, who had nothing more than an old gravel pit to work upon. It was further developed by Sir Joseph Hooker, and no pains have since been spared to improve its scenic beauty.

"I believe it was by accident that its pictorial merits attracted the attention of M. and Mme. de L'Aubinière. At any rate they have devoted two years to the work of depicting its varying aspects, and a collection of their studies is exhibited in a room at the North Gallery.

"A selection from these studies has now been reproduced in the present volume. I gladly accede to their wish that I should write these introductory words. I am glad that the charms of Kew should be made more widely known by their skilful pencils. But I am still more glad that the man of science and the artist should have been found to be able to join hands in a common work. It is, I confess, an unexpected result. But the explanation is not far to seek. Nature in all her aspects and moods has her own beauty, but that beauty is not always, is indeed seldom, pictorial. A direct transcript from nature, as in a photograph, seldom forms a picture. The artist then requires to select, to suppress, to find an agreeable composition. It is for this reason that a purely artificial landscape such as the Kew lake affords is more suitable to his purpose than one which is simply spontaneous. The result of successful landscape gardening may seem unstudied and artless, but this is far

from being the actual fact. Some part of the artist's work is already done to his hand; the composition is determined; what is coarsely rampant has been restrained; what is awkward or needlessly obstructive has been suppressed. But when the art of the gardener has done his share Nature still puts her glorifying touch upon the whole."

Hyoscyamus muticus.—Rear-Admiral Blomfield, Port House, Alexandria, sends (December 31st 1895) the following interesting note:—

We have lately lost (he died on December 9th) Dr. Sickenberger, a very valued old friend of mine and most kind-hearted and modest; he was an excellent botanist. He was a victim to overwork in connection with analyses of poisoning cases which he had undertaken for the Tribunal when he ought to have been having a complete rest in Europe.

In connection with his work, I may mention that this summer I observed a native gathering seeds from a large plant near some houses at Mex, five miles west of this, which I found to be *Hyoscyamus muticus.* The plant was three or four yards in circumference and was in full flower, with its handsome purple blossoms, as well as in fruit. I remembered having seen it in plenty in the valleys near Helouan, south of Cairo, but never before here, and sent a specimen to Dr. Sickenberger, who told me in reply that he had just established *four* cases of family poisoning (*not accident*) by the same seeds.

The natives call the plant "sakrân," which means "drunken" with reference to its properties, a name which at Mex is given to the *Hyoscyamus albus*, which is common there and used medicinally by the natives. How this one plant (the only one known) of *H. muticus* came to existence at Mex no one knows. I will send you a sample.

Chamædorea Pringlei.—This species was described by the late Dr. Sereno Watson in the *Proceedings of the American Academy*, xxvi. p. 157, from specimens obtained from the Tamasopo Cañon, San Luis Potosi, Mexico, said to be the most northern locality for any species of this genus. At that time the female inflorescence was unknown. A plant in cultivation at Kew has now produced female flowers. It has a creeping rhizome about 4 in. long and $1\frac{1}{2}$ in. thick, and near its apex bears a crown of four leaves, each about 2 ft. long with 13 pairs of pinnæ, 8 in. long and 1 in. wide, acute at the apex and slightly constricted, especially on the lower side, at the base. The spadix arises from outside the base of the crown of leaves and attains a length of 18 inches and a diameter of two lines, and bears several distant, brownish, membranous, acute sheaths; at the apex it is somewhat thickened and has a single lateral branch. The flowers are globose, about one line in diameter and not immersed in the spadix. The calyx is deeply 3-partite, with rounded lobes conspicuously edged with dark brown. The petals are rather larger than the sepals, orbicular, concave, and occasionally with a brown spot at the apex. The six short staminodes are compressed and white. The ovary is globose, three-celled and with a single ovule attached to the inner angle of each cell. The stigma is short and 3-lobed. The fruit, which has been received from Mr. C. G. Pringle, is oblong and 4–5 lines long. The spermoderm is grey, minutely warted and sparingly reticulated. This species belongs to the section *Chamædoropsis.*

Juglans jamaicensis.—In the *Kew Bulletin* for 1894 (p. 138 and p. 371), are two paragraphs on the Jamaica Walnut, which is still imperfectly known at Kew. Some drift fruits, referred to in the *Botany of the Challenger Expedition* (i. pt. 3, p. 303), which were overlooked at the time, have recently come to light again. They formed part of a collection of stranded seeds and fruits from Palisadoes Plantation, Jamaica, made by Dr. D. Morris. The endocarp of these fruits is exactly like that represented in Descourtilz (*Flore Pittoresque et Médicale des Antilles*, vii. t. 453), in being exceedingly thick and in having a pointed apex. Whether it had floated down one of the rivers of Jamaica itself to be cast ashore again, or had its origin in one of the neighbouring islands, is uncertain; but hitherto Kew has not succeeded in getting specimens of any walnut-tree growing in Jamaica.

The Tapang Tree.—One of the most conspicuous trees in the State of Sarawak. Borneo, bears a name variously spelled "tapang," "tapan," and "tappan." Mr. (now Sir Hugh) Low, in his book on *Sarawak, its Inhabitants and Productions* (1848), pp. 45 and 314, gives some particulars of its extraordinary dimensions and the fact of its elevated crown being a favourite place with bees for storing their wax. He did not succeed in getting specimens of its flowers or fruit, always a most difficult task; but he guessed it might be a species of *Ficus*. There is a representation of it in the North Gallery (No. 530); and in the catalogue it is referred to as being probably a member of the Dipterocarpeæ. Kew having been applied to for the botanical name of this remarkable tree, further researches have been made with the result that it is discovered to have been described long ago by the well-known traveller and botanist, Dr. O. Beccari; but the connection between the vernacular and scientific names had been overlooked. Dr. Beccari, *Malesia* (1878), p. 169, described it under the name of *Abauria excelsa*, so far as leaves and flowers are concerned, but he had no fruit. Previously, however (in 1873), a Malacca tree, *Koompassia malaccensis*, Maing., had been published in *Hooker's Icones Plantarum*, t. 1164. Suspecting the generic identity of *Abauria* and *Koompassia*, Mr. P. Taubert, of Berlin, communicated with Dr. Stapf, of Kew, who was able to verify the fact. Whereupon Taubert published (*Berichte der deutschen botanischen Gesellschaft*, x. p. 640, t. 32), the results of their joint investigations. He distinguishes three species of *Koompassia*, namely, *K. excelsa*, (*Abauria excelsa*), *K. malaccensis*, and *K. beccariana*; but the copious material at Kew points to the specific identity of the two last.

All travellers agree in describing the *Tapang* as a magnificent tree from 250 to 300 feet high, having a smooth, straight, cylindrical trunk without a branch up to 100 to 150 feet. Yet the flowers of this tree are so minute, about an eighth of an inch in diameter, as to have given rise to the belief among the natives that it bears none. It is a member of the Cæsalpineæ, having pinnate leaves about an inch long, and a thin, oblong, almost papery, one-seeded pod, four or five inches in length.

Koompassia malaccensis, the *Kumpas*, or *Koompass*, of Malacca, is also a handsome tree of gigantic size.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 117–118.] SEPTEMBER and OCTOBER. [1896.

DXXVI.—WHITE TEA OF PERSIA.

(*Camellia theifera*, Griff.)

In the Consular Report on the trade of Ispahan and Yezd (Foreign Office, Annual Series, 1896, No. 1662) the following particulars are given of the tea trade in Persia :—

"Black or Calcutta tea for Persian consumption, continues to arrive in steady quantities, 2,000,000 pounds representing last year's supply. White tea from China, or more particularly from Tongking, is consumed only in Yezd, and, therefore, the supply is limited."

Through the courtesy of Mr. John R. Preece, Her Majesty's Consul at Ispahan, Kew received a small quantity of the "White tea" above-mentioned for the Museum of Economic Botany. The tea proved to be very similar to that described in the *Kew Bulletin* under the name of P'u-êrh tea (*Kew Bulletin*, 1889, pp. 118 and 139). The finest of this tea is said to be reserved for the Court of Peking. The sample from Yezd was composed of the undeveloped leaf buds so thickly coated with fine hairs as to give them a silvery appearance.

Owing to the shaking in transit some of the hairs had been rubbed off and had formed small yellow pellets about $\frac{3}{8}$-inch diameter. Although the hairs are much more abundant than usual there is little doubt that the leaves have been derived from the Assam tea plant (*Camellia theifera*, Griff.) found wild in some parts of Assam and Burma but now largely cultivated in Burma, Tongking, &c. The same species has been shown to yield Lao tea (*Kew Bulletin*, 1892, p. 219), and Leppett tea (*Kew Bulletin*, p. 1896, p. 10).

The liquor from the Persian white tea was of a pale straw colour with the delicate flavour of good China tea. It is not unknown but now little appreciated in the English market. The following particulars respecting it have been kindly communicated to Kew by a well-known firm of tea brokers in the city.

Messrs. Gow, Wilson, and Stanton to Royal Gardens, Kew.

13, Rood Lane, London, E.C.,
Sir, 13th August, 1896.

We duly received your kind letter of last Tuesday's date, together with the sample of tea you had received from Persia. This class of tea has been very scarce during the last few years upon the London market, the price which the English trade were prepared to pay being very unsatisfactory compared with that which could be obtained in Persia. In London this class of tea is called Flowery Pekoe Congou, and the last lot that we remember having seen, which was some two or three years ago, we ourselves sold to a client in Constantinople, the tea evidently being destined for the Persian market.

The name by which you say it is known in Persia, "White Tea," very truly describes the article, but the particular sample which you sent is not so white or silky as some we have previously seen.

For home consumption this tea is not worth much more than 1*s.* per pound, but for export purposes, especially to the market that you named, good specimens command as much as 3*s.* to 5*s.* per pound.

We are, &c.
(Signed) Gow, Wilson, and Stanton.

Dr. Morris, C.M.G.,
Assistant Director,
Royal Gardens, Kew.

DXXVII.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECADES XXVIII.—XXX.

271. **Grewia batangensis,** *Wright* [Tiliaceæ]; arborea, ramis teretibus foliis ovatis acuminatis glabris membranaceis breviter petiolatis nervis secundariis 6–7, cymis axillaribus paucifloris, sepalis ligulatis subtus et supra ad marginem pubescentibus, petalis quam sepala multo brevioribus orbiculatis hirsutis basi intus foveolatis, filamentis sepalis æquilongis tenuibus, antheris oblongis, ovario globoso hirsuto, stylo staminibus æquilongo hirsuto, ovulis pluribus.

Habitat.—W. Tropical Africa: Batanga, *G. L. Bates*, 328.

Arbor 15-pedalis. *Folia* 5–6 poll. longa, 2½ poll. lata. *Sepala* 6 lin. longa, 1 lin. lata. *Petala* 1 lin. diam.

272. **Elæocarpus floridanus,** *Hemsl.* [Tiliaceæ]; præter flores fere omnino glaber, ramulis floriferis crassiusculis, foliis longe petiolatis tenuiter coriaceis ovatis obtusis basi cuneatis remote crenulatis venis primariis lateralibus utrinque 5–7, racemis gracilibus laxis puberulis folia superantibus, pedicellis gracilibus, sepalis lanceolatis vix acutis extus puberulis intus glabris carinatis, petalis oblongis apice sæpe circiter novemfidis (laciniis filiformibus) extus pubescentibus intus lanatis basi bifoveolatis, filamentis puberulis, antheris longe apiculatis, ovario glabro stylo filiformi stamina superante, drupis globosis pisiformibus nitidis.

Habitat.—Solomon Islands: Florida Island, *H. B. Guppy*, 231.

Arbor usque ad 30 ped. alta (fide Guppy). *Folia* absque petiolis 4–5 poll. longa, petiolis 1½–2 poll. longis. *Racemi* 7–8 poll. longi. *Pedicelli* 4–6 lin. longi. *Drupa* sicca 4–5 lin. diametro.

273. **Elæocarpus fauroensis,** *Hemsl.* [Tiliaceæ]; foliis breviter petiolatis tenuiter coriaceis oblongis oblanceolatis vel obovato-lanceolatis obtusis vel rotundatis basi cuneatis crenulatis utrinque glabris venis primariis lateralibus numerosis, racemis brevibus, floribus . . . . . drupis cæruleis (fide Guppy), globosis epicarpio tenui endocarpio durissimo irregulariter alte sulcato.

Habitat.—Solomon Islands: Fauro Island, *H. B. Guppy*, 241.

Arbor 70-pedalis (fide Guppy). *Folia* cum petiolo brevi 7–8 poll. longa, 2–2½ poll. lata. *Pedicelli* circiter pollicares. *Drupa* sicca circiter 9 lin. diametro.

274. **Elæocarpus rarotongensis,** *Hemsl.* [Tiliaceæ]; præter flores glaber, ramulis floriferis crassiusculis, internodiis quam folia multoties brevioribus, foliis longe graciliterque petiolatis tenuisculis coriaceis ovato-oblongis obtuse acuminatis remote calloso-crenulatis undulatis venis primariis lateralibus utrinque 7–9 supra medium furcatis in crenis excurrentibus, petiolis gracillimis basi leviter incrassatis apice geniculatis, racemis numerosis multifloris in axillis foliorum superiorum solitariis, floribus mediocribus pedicellatis, pedicellis puberulis, sepalis anguste lanceolatis vix acutis extus pubescentibus intus glabris carinatis, petalis oblongis sæpe quinquefidis extus pubescentibus intus pilis longis retrorsis dense vestitis carinatis basi bifoveolatis, disco cupulari margine puberulo, filamentis brevibus filiformibus puberulis, antheris apiculatis, stylo stamina paulo superante, drupis parvis ovoideis.

Habitat.—Cook Islands: Rarotonga, *Rev. W. Wyatt Gill.*

Folia absque petiolis 3–6 poll. longa, petiolis 1–2 poll. longis. *Racemi* 2–4 poll. longi. *Pedicelli* fructiferi 4–6 lin. longi. *Sepala* et *petala* circiter 2 lin. longa. *Drupæ* 4–6 lin. longæ.

275. **Impatiens Batesii,** *Wright* [Geraniaceæ]; herbacea, debilis, caule succulento procumbente, foliis alternis petiolatis ovato-lanceolatis membranaceis crenulatis inter crenulationes minute denticulatis utraque hirsutis, pedunculo longissimo debili, floribus purpureis racemosis, bracteis parvis ovatis, sepalis lateralibus ovatis uninerviis, sepalo antico ore obliquo basi in calcar gradatim curvatum producto, petalo postico orbiculari, petalis lateralibus longe unguiculatis lobis lateralibus rotundatis quam anticos deltoideos majoribus.

Habitat.—West Tropical Africa: Cameroons, Efulen, *G. L. Bates*, 286.

Caulis 6 poll. altus. *Folia* 2–2½ poll. longa, 1–1¼ poll. lata; petioli 1–1½ poll. longi. *Pedunculus* 6 poll. longus; pedicelli 3–6 lin. longi. *Sepalum* anticum 6 lin. longum. *Petala* lateralia 8 lin. longa.

Somewhat resembling *Impatiens palpebrata*, Hook. f., in having a long claw to the lateral petals and also in the shape of their laminæ. The spur of the anticous sepal is slightly and gradually curved.

276. **Gomphia discolor,** *Wright* [Ochnaceæ]; fruticosa, ramosa, ramis lævibus teretibus, foliis oblanceolatis acutis coriaceis brevissime petiolatis

supra viridibus subtus aureis nitentibus venulis secundariis numerosissimis approximatis, paniculis multifloris ad ramorum apices terminalibus vel subterminalibus, bracteis parvis deltoideis, sepalis oblongis acutis marginibus membranaceis post anthesin accrescentibus, petalis ovatis apiculatis unguiculatis flavis fugaceis, antheris subsessilibus subulatis rugosis poris 2 terminalibus dehiscentibus, ovario alte 5-lobato 5-loculari, ovulis solitariis erectis, stylo antheris paullo longiore, drupis 2–3.

Habitat.—W. Tropical Africa: Batanga, *G. L. Bates*, 347.

Frutex 2–3 pedalis. *Folia* 6–7 poll. longa, $1\frac{1}{2}$–2 poll. lata. *Flores* 6–8 lin. diam. *Drupæ* 2 lin. diam.

277. **Trichilia alata,** *N. E. Brown* [Meliaceæ]; foliis alternis petiolatis trifoliatis vel pinnatim 3–7 foliolatis, foliolis oppositis sessilibus elliptico-oblongis cuneato-obovatis oblongo-lanceolatis oblongis vel lanceolatis obtusis vel retusis basi cuneatis marginibus leviter revolutis coriaceis opacis costa utrinque prominente et acuta venis inconspicuis, rachi alata, floribus parvis in cymas parvas corymbosas 10–30-floras terminales vel subterminales glabras dispositis, pedicellis brevibus subcrassis, calyce breviter 4-dentato vel late 4-crenato glabro, petalis 4 valde imbricatis ellipticis vel elliptico-obovatis obtusis extus glabris intus minute puberulo-venosis albis, staminum tubo quam petala duplo breviore extus glabro intus villoso apice inæqualiter 8-dentato dentibus omnibus ad apicem antheriferis, antheris 8 oblongis obtusis glabris, disco brevissimo staminum tubo basi adnato 4-crenato, ovario compresso-ovoideo in stylum crassum attenuato glabro 2-loculari loculis 2-ovulatis, fructu (immaturo ?) compresso-globoso 2-spermo, seminibus plano-convexis tenuiter albuminosis, cotyledonibus subplanis crassis, radicula exserta.

Habitat.—Natal: Umhloti, *Wood*, 1022; Groenberg, *Wood*, 1043, and near Pinetown 1100 ft., *Wood*, 3403, 5439. Transvaal: near Barberton, on the eastern slopes of the Saddleback Range, 4500 ft., *Galpin*, 1226, and at Upper Moodies, 4400 ft., *Galpin*, 1083.

Frutex vel arbor usque ad 25 ped. alta. *Folia* $1\frac{3}{4}$–5 poll. longa, $1\frac{1}{2}$–3 poll. lata; foliorum petioli $\frac{1}{2}$–$1\frac{1}{4}$ poll. longi, foliola 1–2 poll. longa, 3–9 lin. lata. *Cymæ* 6–10 lin. diam. *Pedunculi* 4–14 lin. longi. *Pedicelli* $\frac{1}{2}$–1 lin. longi. *Calyx* $\frac{1}{3}$–$\frac{1}{2}$ lin. longus. *Petala* $1\frac{3}{4}$ lin. longa, 1 lin. lata. *Staminum tubus* $\frac{3}{4}$–1 lin. longus, antheræ $\frac{1}{2}$ lin. longæ. *Fructus* 3–4 lin. diam.

From the presence of albumen in the seed and the exserted radicle of the embryo, this plant would fall under the tribe *Melieæ* according to the characters given in C. De Candolle's monograph, but upon examination, I find that the characters of albumen and radicle do not hold good in all cases, as the genera are at present defined, and as in other respects it agrees with *Trichilia*, I refer it to that genus. *T. alata* appears to be allied to the West Indian *T. havanensis*, Jacq., which it somewhat resembles in foliage and has the same seed structure. It also bears a considerable resemblance to *Cipadessa boiviniana*, Baill., from Madagascar, but the stamens of that plant are entirely different.

278. **Chailletia chartacea,** *Wright* [Chailletiaceæ]; fruticosa, ramis gracilibus foliis brevissime petiolatis ovatis acuminatis glabris (costis subtus exceptis), cymis axillaribus paucifloris, sepalis oblongis primum extus pubescentibus ab ovario liberis, petalis spathulatis bifidis, staminibus petalis æquilongis antheris parvis albis, ovario globoso pubescente

triloculari, ovulis solitariis pendulis, stylo elongato filiformi apice trifido.

Habitat.—West Tropical Africa: Batanga, *G. L. Bates*, 337.

Frutex 4–5 ped. altus. *Folia* 2–3 poll. longa, 1–1½ poll. lata; petioli 1 lin. longi. *Flores* 2 lin. diam.

279. **Crassula aloides**, *N. E. Brown* [Crassulaceæ]; caule erecto robusto apice dense folioso basi nudo, foliis aloiformibus confertis rosulatis valde recurvatis rectis vel leviter falcatis sessilibus e basi ad apicem gradatim attenuatis acuminatis glabris subflaccidis minute cartilagineo-ciliatis utrinque viridibus non glaucis, pedunculo elongato, corymbo amplo ramulis parce papillato-scaberulis, bracteis sessilibus attenuato-acuminatis ciliatis glabris, floribus parvis numerosissimis dense confertis pedicellatis pallide luteis, calyce usque ad medium 5-lobo lobis ovatis acutis glabris, petalis quam calyx subtriplo longioribus oblanceolato-oblongis obtusis apice dorso minute tuberculatis glabris, staminibus quinque petalis æquilongis, squamis hypogynis cuneato-obcordatis quam carpella subtriplo brevioribus.

Habitat.—Transvaal: Houtbosch, *Rehmann*, 6375; hillsides, in damp places near Barberton, 2000–4000 ft., *Galpin.*

Caulis plantæ juvenilis 1–1½ poll. crassus. *Folia* 10–18 poll. longa, basi 1½–2½ poll. lata. *Pedunculus* 3–4 ped. altus. *Corymbus* 18 poll. diam. *Pedicelli* 1¼–1½ lin. longi. *Calyx* ½ lin. longus, lobis ¼ lin. longis. *Petala* 1½ lin. longa, ½ lin. lata. *Squamæ* ¼ lin. longæ.

Young plants of this very remarkable species are in cultivation at Kew, raised from seeds sent by Mr. Galpin. Its general appearance is very much like that of an *Aloe* with thin drooping leaves.

280. **Luffa Batesii**, *Wright* [Cucurbitaceæ]; scandens, suffruticosa, foliis cordatis integris vel sparse angulato-dentatis glabris nervis dense reticulatis præsertim ad inferam paginam elevatis, petiolis elongatis eglandulosis, cirrhis lateralibus 2–fidis, floribus masculis racemosis bracteis subulatis pedicellis plus minusve adnatis, calyce infundibuliformi inferne inflato dentibus parvis acutis eglandulosis, petalis liberis obovatis luteis nervis primariis secundariisque fuscis, staminibus 5 calycis ori insertis, filamentis liberis brevibus compressis, antheris bilocularis contortis, floribus femineis non visis.

Habitat.—West Tropical Africa: Cameroons River, *G. Mann*, 719; Efulen, *G. L. Bates*, 218; Batanga, *G. L. Bates*, 338; Angola, 70 miles from Ambriz on the road to Bembe, *Monteiro*

Caulis 20 ped. longus (ex *Mann*). *Folia* 5 poll. longa, 4 poll. lata, petioli 2 poll. longi. *Racemus* 8 poll. longus. *Calyx* 8 lin. longus, apice 3 lin. diam. *Corolla* 3 poll. diam.

This is readily distinguished by the long calyx-tube inflated below so as to resemble an ovary, and by the stamens all bearing bilocular anthers.

281. **Alepidea setifera**, *N. E. Brown* [Umbelliferæ]; caule erecto apice corymboso- vel paniculato-ramoso folioso, foliis radicalibus petiolatis lineari-oblongis vel ellipticis acutis vel obtusis marginibus longe setoso-dentatis utrinque glabris, foliis caulinis numerosissimis sessilibus auriculatis amplexicaulibus imbricatis lineari-lanceolatis vel ovato-lanceolatis marginibus longe setoso-dentatis utrinque glabris,

inflorescentiæ ramulis 1–3-capitatis ad medium tribracteatis glabris vel minute glandulosis, capitulis 13–15-floris 8–10-bracteatis bracteis basi connatis lanceolatis acutis mucronatis glabris, floribus sessilibus, calycis dentibus deltoideis acutis, fructibus plus minusve papilloso-rugosis.

Habitat.—Transvaal: Hoghe Veldt, Pages Hotel, *Rehmann*, 6849; swampy ground, Umlomati Valley, Barberton, 4000 ft., *Galpin*, 1290. Natal: hill near Van Reenen's Pass, 5000–6000 ft. *Wood*, 5630.

Herba 12–18 poll. alta. *Folia* radicalia cum petiolo 1–2 poll. longa, 3–7 lin. lata, caulina 5–9 lin. longa, 2–5 lin. lata. *Inflorescentiæ ramuli* 9–15 lin. longi. *Involucri bracteæ* 2–3½ lin longæ, ½–1 lin. latæ.

282. **Chrysophyllum batangense**, *Wright* [Sapotaceæ]; arbor parva, foliis anguste oblanceolatis obtuse acuminatis coriaceis subtus glaucescentibus nervisque conspicuis, floribus paucis in axillis foliorum vetustiorum fasciculatim congestis, sepalis liberis oblongo-ovatis pubescentibus, corolla 5-partita quam sepala paulo longiore lobis ovatis imbricatis, staminibus corollæ tubo adnatis et lobis ejusdem oppositis, ovario 5-lobato, 5-loculari, stylo indiviso, ovulis solitariis.

Habitat.—West Tropical Africa: Batanga, *G. L. Bates*, 325.

Folia 6 poll. longa, 1½ poll. lata; petioli 3–6 lin. longi. *Flores* 3 lin. diam.

283. **Strychnos Gerrardi**, *N. E. Brown* [Loganiaceæ]; inermis ecirrhosa, ramis teretibus cortice griseo, foliis petiolatis lanceolatis ellipticis vel elongato-obovatis apice obtusis obtuse acuminatis vel obtusissime rotundatis basi cuneato-acutis pergamentaceis glabris 3-nerviis lateralibus 2–3 lin. supra laminæ basin abeuntibus nervis venisque utrinque prominentibus, cymarum axillarium subfasciculatarum ramulis 3–5-floris, sepalis orbiculatis obtusissimis ciliolatis, corollæ tubo cylindrico extus glabro intus ad faucem pilis albidis densissime intertextis barbato lobis 4 ovatis subacutis glabris patentibus.

Habitat.—Natal: Berea, *Wood*, 5624; in Gardens, *Wood*, 1777; without locality, *Gerrard*, 1421.

Foliorum petioli 1–3 lin. longi, laminæ 1¼–4 poll. longæ, ½–1¼ poll. latæ. *Cymarum rami* vel pedunculi 1–2 lin. longi. *Pedicelli* ½–1½ lin. longi. *Sepala* ¾–1¼ lin. longa et lata. *Corollæ tubus* 1¼ lin. longus, lobi 1–1¼ lin. longi.

284. **Xysmalobium obscurum**, *N. E. Brown* [Asclepiadeæ]; caule simplice pubescente, foliis subsessilibus lanceolatis acutis basi cuneatis utrinque glabris venis reticulatis prominentibus marginibus anguste revolutis, umbellis lateralibus sessilibus 4–6-floris, pedicellis pubescentibus, sepalis lanceolatis acuminatis glabris, corollæ lobis ovatis acutis reflexis glabris, coronæ lobis erectis crasso-carnosis subobovoideo-oblongis obtusis ecarinatis.

Habitat.—Nyasaland, *Buchanan*.

Planta circa 1 ped. alta. *Folia* 2–2¾ poll. longa, 5–7 lin. lata. *Pedicelli* 2–4 lin. longi. *Sepala* 1½ lin. longa. *Corollæ lobi* 2 lin. longi, 1 lin. lati. *Coronæ lobi* ¾ lin. longi.

285. **Ipomœa (Strophipomœa) hirsuticaulis**, *Wright* [Convolvulaceæ]; scandens, caule leviter striato hirsuto, foliis cordatis acuminatis

utrinque glabris longe petiolatis, floribus corymboso-cymosis, sepalis late ovatis breviter mucronatis, corolla quam sepala 4–5 plo longiore, staminibus inæqualibus.

Habitat.—West Tropical Africa: Batanga, *G. L. Bates*, 341.

Folia 3 poll. longa, 2–2½ poll. lata; petioli 2 poll. longi. *Pedunculus* 3–4 poll. longus; pedicelli 4 lin. longi. *Sepala* 4 lin. longa, 3 lin. lata. *Corolla* 1½–2 poll. longa.

Resembling *Ipomœa nuda*, Baker, from which it differs in its hirsute stem and broadly ovate sepals which terminate in a short mucro.

286. **Lyperia punicea**, *N. E. Brown* [Scrophulariaceæ]; caulibus plurimis e rhizomate lignoso perenni annuis basi sæpe decumbentibus foliosis dense glanduloso-pilosis, foliis petiolatis inferioribus oppositis superioribus alternis ovatis apice obtuse rotundatis basi subtruncatis crenato-dentatis utrinque glanduloso-pubescentibus, floribus axillaribus pedicellatis in racemum terminalem dispositis, calyce fere ad basin 5-lobato lobis oblongo-spathulatis apice concavis vel plus minusve complicatis et recurvis subobtusis utrinque glanduloso-pilosis, corolla purpureo-coccinea inæqualiter bilabiata tubo brevi extus glanduloso-pubescente labio superiore minore bilobato lobis rotundatis abio inferiore trilobato lobis lateralibus elliptico-oblongis lobo medio obovato omnibus obtusissimis glabris, staminibus inclusis filamentis glabris, stylo incluso apice subclavato stigmate subcompresso truncato.

Habitat.—Natal: slopes of the Drakensberg, *Evans*, 392; Weenen County, South Downs, at 5000 feet, *Wood*, 4422; Maritzburg County, at 3800 feet, *Wood*, 3572; Faku's Territory, *Sutherland*. East Griqualand: Vaal Bank, *Wood*, 4214; *Haygarth*; near Kokstad, at 5000 feet, *Tyson*, 1645; sides of the mountains at 6000 feet, *Tyson*, 1363.

Caules 4–12 poll. longi. *Foliorum petioli* 1–4 lin. longi, laminæ 3–9 lin. longæ, 3–7 lin. latæ. *Pedicelli* 3½–9 lin. longi. *Calycis lobi* 2¼ lin. longi, ¾ lin. lati. *Corollæ tubus* 2½ lin. longus, limbus circa 6 lin. diam. lobis 2–2½ lin. longis, 2¼–2½ lin. latis.

A well-marked species allied to *Chænostoma corymbosa*, Marloth and Engler, which on examination I find to be a *Lyperia* (*L. corymbosa*, N.E. Br), having affinity with *L. canariensis*, Webb. The flowers are stated by Mr. Evans to be "deep scarlet," by Mr. Wood "red" and "dull crimson," and by Mr. Tyson as "intense rosei."

287. **Diclis tenella**, *Hemsl.* [Scrophulariaceæ]; molliter hirsuta, ramosissima, ramis gracillimis debilibus repentibus radicantibus, foliis tenuissimis membranaceis longe graciliterque petiolatis rotundato-ovatis grosse serrato-dentatis basi rotundatis vel subcuneatis, pedunculis axillaribus solitariis capillaribus folia superantibus, floribus parvis, calycis segmentis inæqualibus ovato-oblongis, corollæ labio superiore æqualiter bilobato lobis rotundatis, labio inferiore longiore inæqualiter trilobato lobis lateralibus obliquis intermedio angustiore recto, calcari elongato curvato, capsula late bilobata lobis rotundatis.

Habitat.—British Central Africa: Mount Chiradzulu, *A. Whyte.*

Rami 6–12 poll. longi. *Foliorum laminæ* 6–12 lin. latæ, petiolis 3–12 lin. longis sed sæpe circiter 6 lin. longis. *Pedunculi* 1–2 poll. longi. *Calycis segmenta* ½–¾ lin. longa. *Corolla* cum calcari 3–4½ lin. longa, parte calcarata 2–3½ lin. longa, limbo circiter 2 lin. diametro. *Capsula* circiter 1½ lin. lata.

288. **Dianthera celebica,** *Rolfe.* [Acanthaceæ]; caule puberulo, foliis petiolatis ovatis subobtusis obscure crenulatis membranaceis supra viridibus subtus subpallidis pauce puberulis, cymis terminalibus laxe paniculatis parvis paucifloris puberulis, bracteis subulato-linearibus, floribus brevissime pedicellatis, calyce profunde 5-partito lobis linearibus subacutis minutissime puberulis, corollæ tubo brevi fauce ampliato lobis rotundato-oblongis, staminibus 2 inclusis, antheræ loculis disjunctis distantibus muticis, capsulis clavatis glabris tetraspermis.

Habitat.—South Celebes: Bonthain Peak, at 7000 ft., *A. H. Everett*, 29.

Folia $\frac{3}{4}$–2 poll. longa, 5–12 lin. lata; petioli 2–6 lin. longi. *Paniculæ* 2–3 poll. longæ. *Bracteæ* $\frac{3}{4}$ lin. longæ. *Calyx* 2 lin. longus. *Corolla* 5 lin. longa. *Capsulæ* 5 lin. longæ.

Nearly allied to the Himalayan *D. collina*, C. B. Clarke, which it much resembles in general character, except that the corolla is only half as long as in that, and proportionately broader.

289. **Salvia yunnanensis,** *Wright* [Labiatæ]; herbacea, rhizomate repente tuberis fusiformibus gerente, foliis sæpius radicalibus longissime tenuiterque petiolatis oblongis crenatis supra viridibus subtus purpureis, inflorescentia simplice verticillis 4–6-floris, calyce glanduloso bilabiato labio postico obscure bifido labio antico dentibus 3 acutis, corolla extus pubescente bilabiata labio superiore falcato labio inferiore patente trilobato lobo terminali integro rotundato quam laterales duplo majore, staminibus stylisque generis.

Habitat.—China: Yunnan, Mongtse, mountain slopes at 5000–6500 ft., *W. Hancock*, 61.

Herba 1 ped. alta. *Folia* 1½–3 poll. longa, $\frac{3}{4}$–1 poll. lata; *petiolus* 4 poll. longus. *Calyx* 4–5 lin. longus. *Corolla* 1 poll. longa.

Allied to *S. hians*, Royle, which however has sagittate leaves. The leaves of this species resemble those of *S. scapiformis*, Hance, but the cobalt-blue flowers are very different.

290. **Scutellaria amœna,** *Wright* [Labiatæ]; herbacea sparse pilosa, caule erecto obtuse quadrangulari, foliis oblongis glabris vel sparse pilosis integris breviter petiolatis, floribus erectis per paria in racemos secundos dispositis, pedicellis brevibus, bracteis superioribus quam calyx paullo longioribus, calycis pilosi lobis rotundatis, corolla magna cærulea extus pubescente per tubi curvationem erecta, nuculis non visis.

Habitat.—China: Yunnan, Mongtse, open grassy glens at 5500 ft. *W. Hancock* 2; Szechuen, near Tachienlu, *A. E. Pratt*, 580 and 703.

Planta 1 ped. alt. *Folia* 1–1¼ poll. longa, 6 lin. lata. *Calyx* 1–2 lin. longus. *Corolla* 1 poll. longa.

Flowers like those of *S. macrantha*, Fisch., from which this differs in having oblong, not linear-lanceolate leaves.

291. **Freycinetia marantifolia.** *Hemsl.* [Pandanaceæ]; species insignis, nana, erecta, foliis brevissime vaginantibus subcoriaceis obovato-oblongis abrupte cuspidato-acuminatis deorsum leviter attenuatis circiter 40-nerviis aculeis minutis paucissimis in marginibus secus costam et præsertim in cuspide instructis, bracteis inflorescentiæ delapsis, spadicibus

femineis ternis distincte pedunculatis oblongis, pedunculis crassis glabris, floribus confertissimis infra inter se connatis, baccis parvis placentis 5 multispermis, seminibus fusiformibus curvatis.

Habitat.—Solomon Islands: Fauro Island, *H. B. Guppy*, 324.

Planta tripedalis (fide *Guppy*). *Folia* 5–7 poll. longa, supra medium 2 2½ poll. lata, cuspide 3–4 lin. longo. *Spadicium pedunculi* 9–12 lin. longi, pars baccas maturas gerens circiter pollicaris.

292. **Freycinetia humilis**, *Hemsl.* [Pandanaceæ]; nana, foliis lanceolatis rigidis coriaceis creberrime nervosis basi leviter dilatatis ut videtur vix vaginantibus basi et apicem versus et subtus secus costam aculeis paucis minutis instructis vix acutis, bracteis non visis, spadicibus femineis binis? longe pedunculatis cylindricis pedunculis crassis glabris, floribus femineis inter se fere liberis, stigmatibus confluentibus, staminodiis filiformibus ovario æquantibus.

Habitat.—Solomon Islands: Fauro Island at 1600 ft., *H. B. Guppy*, 323.

Folium unicum visum sesquipedale. *Pedunculi* circiter bipollicares. *Spadicium femineorum* pars flores gerens 1½–1¾ poll. longa.

293. **Freycinetia rigidifolia**, *Hemsl.* [Pandanaceæ]; gracilis, scandens (fide *Haviland*) glabra, foliis confertis brevibus angustis rigidi-rectis ascendentibus vix acutis siccis arcte revolutis multistriatis apicem versus dorso in costa marginibusque aculeis minutis instructis basin versus aculeis majoribus armatis basi late vaginantibus, vaginis latis auriculatis aculeis rectis crebris vix rigidis marginantibus, spadicibus femineis terminalibus ternis subsessilibus oblongo-cylindricis bracteis crassis lanceolatis rubris apicem versus aculeolatis exterioribus in apicem foliiformem desinentibus circumdatis, floribus maxime juvenilibus tantum visis, stigmatibus binis.

Habitat.—Borneo: Sarawak, conglomerate rocks at 2000 ft. *G. D. Haviland*, 436.

Internodia foliis omnino vaginantibus *Folia* circiter pedalia, parte vaginante bipollicari, 4–5 lin. lata, aculeis maximis lineam vix excedentibus. *Bracteæ* 3–7 poll. longæ, infra medium 8–12 lin. latæ. *Spadices* circiter sesquipollicares.

294. **Freycinetia philippinensis**, *Hemsl.* [Pandanaceæ]; robusta, pedunculis exceptis glabra, foliis confertissimis brevissime vaginantibus tenuibus tenacissimis latis fere oblongis acuminatis deorsum leviter angustatis in marginibus apicem versus et infra medium et dorso secus costam aculeis brevibus instructis creberrime striato-nervosis, nervis utrinque 23–25, bracteis latissimis coloratis exterioribus longioribus superne foliaceis plus minusve aculeolatis, spadicibus femineis 4–5 aggregatis oblongis distincte pedunculatis, pedunculis crassis furfuraceis, floribus femineis confertissimis inter se liberis vel basi tantum coalitis.—*Freycinetia luzonensis*, var. *heterophylla*, Naves in Blanco Fl. Filip. ed. 3. Nov. App. p. 286, t. 437, non Miq.

Habitat.—Philippine Islands: without locality, *Cuming*, 1898.

Folia 12–15 poll. longa, 2–2¼ poll. lata, aculeis ½–1 lin. longis. *Bracteæ* 1½–2 poll. latæ. *Pedunculi* 1½–2 poll. longi. *Spadicum pars florifera* circiter 1¼ poll. longa.

The figure cited above does not agree exactly with Cuming's plant, the leaves being armed throughout their whole length; but it most probably represents this species, which certainly is not even closely allied to *F. luzonensis*.

295. **Freycinetia Vidalii**, *Hemsl.* [Pandanaceæ]; species *F. angustifoliæ* et *F. pycnophyllæ* similis, caulibus scandentibus dense foliatis, foliis breviter vaginantibus, vaginis auriculatis, tenuibus simul coriaceis lentisque flexuosis angustis fere linearibus sursum valde attenuatis subtus pallidioribus per totam longitudinem in marginibus et dorso ad costam aculeis parvis vel minutis munitis, bracteis lanceolatis coloratis (aurantiace?) exterioribus longe caudatis spadices femineos superantibus, caudicibus plus minusve foliaceis aculeolatis, spadicibus femineis ternis pedunculatis, pedunculis crassis sursum leviter spongiosis, parte florifera parva ovoidea vel oblonga, floribus femineis inter se liberis supra medium stigmatibus nigricantibus exceptis crustaceis eburneis, staminodiis brevibus filiformibus.

Habitat.—Phillipine Islands: Bayombong, Nueva Vircaya, Luzon, *Vidal*, 3964.

Folia sesquipedalia, maximis 2½–3 lin. latis. *Bracteæ* interiores 2–2½ poll. longæ; exteriores longiores. *Pedunculi* 1–1½ poll. longi. *Spadicis* pars florifera 4–6 lin. longa.

296. **Freycinetia formosana**, *Hemsl.* [Pandanaceæ]; robustissima, glabra, *F. arboreæ* affinis, foliis confertissimis superioribus subdistichis lineari-lanceolatis elongatis e basi lata sursum gradatim attenuatis vix acutis basin et apicem versus aculeolatis et aculeolis paucissimis dorso secus costam sparsis, bracteis foliaceis basi latissimis coloratis exterioribus foliis fere æquantibus, spadicibus femineis maximis 3–5 fasciculatim aggregatis valide pedunculatis, floribus femineis inter se fere liberis, staminodiis obsoletis, stigmatibus 3–9 sæpius circiter 6.

Habitat.—Formosa: without locality, *Oldham*, 630; Kelung, *Ford*, 45.

Folia 2–3 ped. longa, basi 1–1½ poll. lata sursum valde attenuata. *Bracteæ* basi usque ad 2½ poll. latæ. *Spadices feminei* cum pedunculis brevibus 4–6 poll. longi, sicci 7–9 lin. diametro.

This is very similar to *F. arborea*, Gaud. in general appearance, but the leaves are not aculeate throughout their whole length, and the female spadices are always more than one or two.

297. **Freycinetia Beccarii**, *Hemsl.* [Pandanaceæ]; species *F. marantifoliæ* similis sed evidenter scandens caulibus elongatis, foliis ut videtur in apicibus innovationum confertis amplexicaulibus nec vaginantibus tenuiter coriaceis obovato-oblongis vel oblanceolatis abrupte cuspidato-acuminatis deorsum angustatis basin et apicem versus in marginibus aculeolatis dorso supra medium ad costam pauci-aculeolatis multinerviis (utrinque circiter 23–25), bracteis parvis foliaceis, spadicibus femineis ternis parvis valide pedunculatis ovoideis vel oblongis, floribus femineis parvis staminodiis minutis, stigmatibus 2–3.

Habitat.—Borneo: Sarawak, *Beccari*, 3598.

Folia 3–9 poll. longa, 1–3 poll. lata. *Bracteæ* semipollicares. *Pedunculi* pollicares. *Spadicium femineorum* pars florifera circiter 6 lin. longa.

298. **Freycinetia Creaghii**, *Hemsl.* [Pandanaceæ]; foliis brevibus tenuiter coriaceis laxe vaginantibus linearibus acutis basin et apicem versus minute aculeolatis multinerviis deorsum gradatim minoribus infimis innovationum bracteiformibus, inflorescentia distincte pedunculata, bracteis brevibus latis vix acutis crassis coloratis ornatis, spadicibus masculinis ternis minimis breviter pedunculatis parte florifera cylindrica, staminibus numerosis filamentis fere liberis.

Habitat.—British North Borneo, *Governor Creagh.*

Folia superiora circiter 6 poll. longa, inferiora ad vaginam reducta *Pedunculi* communi 1–1½ poll. longi. *Spadicium* pedunculi circiter semipollicares, pars florifera 3–4 lin. longa.

299. **Freycinetia caudata**, *Hemsl.* [Pandanaceæ]; scandens, epiphytica (fide Horne) caulibus graciliusculis internodiis distinctis, foliis parvis tenuiter coriaceis lineari-lanceolatis abrupte caudato-acuminatis basin versus subito angustatis complicatis semiamplexicaulibus nec vaginantibus apicem versus præsertim in acumine aculeis minutis instructis cum costa circiter 31-nerviis, bracteis coloratis herbaceis lanceolatis aculeolato-cuspidulatis spadices superantibus, spadicibus femineis ternis parvis distincte pedunculatis cylindricis, staminodiis minutis stigmatibus 3.

Habitat.—Fiji: on trunks of trees throughout the islands, *J. Horne*, 592; without locality, *Græffe.*

Folia 2–8 poll. sæpius, 5–6 poll. longa, maxima 1 poll. lata. *Pedunculi* 6–9 lin. longi. *Spadicium* femineorum pars florifera 1–1¼ poll. longa.

300. **Freycinetia sumatrana**, *Hemsl.* [Pandanaceæ]; robusta, foliis confertissimis coriaceis rigidissimis linearibus longis basi vix dilatatis sursum valde attenuatis sed vix acutis remote aculeolato-denticulatis siccis revolutis creberrime nervosis costa valida, bracteis foliaceis basi coloratis e basi lata longissime caudatis, spadicibus mediocribus quaternis distincte pedunculatis oblongis, staminodiis minimis vel obsoletis, stigmatibus 2–3.

Habitat.—Sumatra: Mount Singalan, *Beccari*, 211.

Folia 2–3 ped. longa, basi circiter 1 poll. lata. *Bracteæ* 9–12 poll. longæ, basi 1½–2 poll. latæ. *Pedunculi* circiter pollicares. *Spadicium femineum* pars florifera 9–12 lin. longa.

DXXVIII.—NEW SEEDLING SUGAR-CANE IN QUEENSLAND.

The Annual Report of the (Queensland) Department of Agriculture for the year 1894–5, describes the progress (pp. 5–7) of the sugar industry "which may fairly be rated as among the first in Queensland." Much of the impetus that has been given to the growth and manufacture of sugar during the past three years is attributed to the success of the central mills at Mackay. "The establishment of these mills has led to an entire change in the industry, and especially have they been the cause of large estates being sub-divided and sold, or let on lease in small areas, the existing mills upon these estates being converted into a central

mill." At the present time there are 1387 sugar plantations, with a total area of 69,031 acres. In 1893 the yield of sugar was 76,146 tons, in 1894 it was 91,711 tons. "Not only did 1894 see the greatest number of acres crushed for cane, but it also gave the highest average return per acre, which latter can be set down to favourable seasons and improved machinery." The Under-Secretary for Agriculture adds, "The great influence that the establishment of the central sugar-mill system has exerted over the industry, leads me to point out the further necessary assistance that could be given by the establishment of a State nursery wholly devoted to experiments in the growth and cultivation of sugar-cane. . . . Experiments in the direction indicated have been effected in the existing nurseries at Mackay and Kamerunga." For cultivation in these nurseries new sugar-canes have been obtained from New Guinea. A new variety of considerable promise has also shown itself amongst some seedling canes grown at Kew. These were raised from seed received from the Botanic Station at Barbados in 1889. They were forwarded to Queensland through the Agent-General in London, in October 1890. The new variety has been named "Kewensis." From the particulars of the analysis given below, it would appear to be rich in sugar, and likely to be of great service. It is described as "a splendid cane not so long as many others, but thick, exceedingly heavy, and producing a large number of canes to a stool. The crop coming on is in fine condition, and a good many tons will be ready for distribution by October" (p. 54).

The following extract (p. 20) gives the analytical results as regards the Kew cane:—

"Through the kindness of the Colonial Sugar Company, some of the varieties growing at Mackay were tested by Mr. G. E. Holroyde, the chemist at the refinery, New Farm, the samples of juice submitted to him being from the 'Batoe,' a New Guinea cane, and from the 'Kewensis,' a seedling received from Kew. It is intended that all the varieties of cane growing at the nurseries shall be tested during the coming season, so that only those of value to the sugar-growers shall be retained. Experiments also, as far as land and means will permit, will be made in a systematic manner with the different fertilisers available in the market, to arrive at the effect upon the growth and sugar-producing qualities of the cane. As each nursery is now provided with water, experiments can be more faithfully carried out. The following are the analyses arrived at by Mr. Holroyde:—

"Analysis of juice from seedling cane grown at Mackay. Name of cane, Kewensis:—

Total solid matter	22·75	per cent.
Total cane sugar	19·60	"
Total fruit sugar	1·93	"
Total density	12·60	"

"Analysis of juice from New Guinea cane, first ratoon. Age, about ten months; variety, Batoe:—

Total solid matter	20·80	per cent.
Total cane sugar	16·85	"
Total fruit sugar	2·56	"
Total density	11·50	"

"Deterioration by keeping the cane or juice has no doubt taken place to the extent of probably 2·7 per cent. of cane sugar."

The *Kew Bulletin* for 1894 (pp. 84–86) contains an account of the success obtained from seedling sugar-canes in British Guiana and Mauritius. Since this was published a fuller "Report on the Agricultural work in the Botanical Gardens, for the years 1891–92 (Demerara, 1894)," has been issued. This contains, pp. 11–26, an elaborate report of the further progress of the experiments in British Guiana. Four of the seedlings raised in 1889 are stated by the writer to be, "the richest canes in sucrose we have examined during our extended experience in this colony and the West Indies." Further, "six of the seedling canes raised in 1889 . . . gave results in excess of those yielded by the Bourbon in a year in which those canes had given results considerably above the average, and what is of great importance . . . is that . . . these results were due not to excessively high yields of canes per acre, but to the high saccharine richness of the canes."

The general conclusion arrived at that "the saccharine richness of a seedling cane is equally as problematical as the conjecture beforehand as to its colour or size" is in accordance with general experience.

The following correspondence has taken place with the Queensland Government with respect to the Kew seedling:—

AGENT GENERAL FOR QUEENSLAND to ROYAL GARDENS, KEW.

Queensland Government Office,
Westminster Chambers, 1, Victoria Street,
London, S.W., 10th August 1896.

SIR,

I HAVE the honour to enclose a copy of a letter which I have received from the Under Secretary of the Department of Agriculture, Brisbane, concerning some seedling sugar canes supplied by you in October 1890, and I shall feel obliged if you can furnish me with the information desired.

I have, &c.
(Signed) CHAS. S. DICKEN,
Acting Agent General.

The Director,
Royal Gardens, Kew.

[Enclosure.]

QUEENSLAND.

Department of Agriculture, Brisbane,
17th June 1896.

SIR,

IN December 1890 this Department received a Wardian case of seedling sugar canes from the Royal Gardens at Kew, as advised in your letter of 23rd October 1890. These seedlings, as you were informed, were planted in the State Nursery at Mackay, which at that time had only just been started. They have resulted in a cane that is so well thought of in the Mackay district and elsewhere, as being "first in sugar, a great stooler, and rattooner, with fine broad healthy foliage, and having all the characteristics of a first-class cane, that all who have seen it here this season are captivated by its appearance." (*Report* of Overseer, State Nursery.) I shall be glad to know whether the Director of the Royal Gardens has received favourable reports from other places, and any further information concerning the cane whence the seedlings were derived that may be available. No name accompanied

the canes, and no information other than that the seedlings were raised from seed received from Barbados, accompanied your letter above referred to, so that pending a more authoritative common name, the cane is now known here generally by the name of Kewensis; I shall be glad, however, to entertain any correction in the nomenclature.

Great care has been taken in propagating the cane with the result that the department has been enabled to place cuttings, &c., with reliable persons in various parts, so that the variety is in a fair way to be spread over the sugar-growing districts, and each year increasing the available supply. The analysis [printed above] taken by the Colonial Sugar Refinery Company, at their laboratory, New Farm, Brisbane, from the juice of first ratoons about 10 months old, may be interesting, but in reading it you must remember that the canes had first of all to spend a few days in travelling from the Mackay nursery to the laboratory.

I have, &c.
(Signed) PETER McLEAN,
Under Secretary.

The Agent General for Queensland,
Victoria Street, London, S.W.

ROYAL GARDENS, KEW, to QUEENSLAND GOVERNMENT OFFICE.

Royal Gardens, Kew,
August 12th, 1896.

SIR,

I HAVE the honour to acknowledge the receipt of your letter of August 10th, transmitting correspondence on the subject of seedling sugar-canes sent to Queensland in October 1890.

2. I have read the report with great interest and satisfaction. The results so far in other sugar-growing colonies of the attempt to obtain improved varieties of sugar-cane from seed have scarcely been so promising. In a case of this kind success is always a matter of pure chance. It is a piece of great good fortune that a cane of merit has been supplied to Queensland by this means.

3. The history of this important seedling cannot be carried very far. It was raised at Kew from seed obtained from the Botanic Station at Barbados. The origin of this is not certainly known. It was probably the Bourbon or Otaheite. But as the seedling can only be regarded as a seminal sport, the parentage of the seed is really immaterial.

4. The cane may be conveniently spoken of as the "Kew seedling" or, if preferred, as Kewensis.

I am, &c.
(Signed) W. T. THISELTON-DYER.

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DXXIX.—CULTIVATION OF INDIA RUBBER IN ASSAM.

The Assam rubber plant (*Ficus elastica*, Roxb.) is a large evergreen tree found in damp forests from the base of the Sikkim Himalaya eastward to Assam and Arracan. Kurz remarks that it is frequent in Upper Burma where whole forests exist in the valley of Hookhoom. The Government of India has of late years attempted to establish regular plantations of rubber trees in Assam and Madras. A memorandum, by Mr. Gustav Mann, Conservator of Forests, Assam, describing the growth of trees from seeds, was given in the *Kew Bulletin*, 1891, pp. 100–2. In the *Kew Bulletin*, 1892, p. 68, it was stated that the imports into this country of Assam and Rangoon rubber in 1891 amounted to 350 tons.

The Government of India issued directions in May 1884 that for five years from that date the Assam plantations should be increased by 200 acres a year. Part of this extension it was recommended should be situated on higher ground than hitherto planted. At the same time, it was added, endeavours should be made to induce private persons to plant india-rubber trees on their estates, seedlings being offered by the Forest Department at cost price. It was also suggested that the experimental planting of *Ficus elastica*, as an epiphyte might with advantage be undertaken by the Forest Department. In a state of nature this plant generally reproduces itself in this way, and although the growth of the seedlings thus raised is slow at first, the trees are said to grow to much larger dimensions ultimately. This method of reproduction is moreover inexpensive, as the seedlings do not require any attention after they have once been deposited in the upper forks of trees. The Government of India also desired that in order to test the financial results of the cultivation of this rubber 50 mature trees should be experimentally tapped annually. In the reports of subsequent years the results of these experiments are fully given. The amount of rubber obtained showed a singular irregularity year by year. It varied so greatly that while the yield in one year was as much as 26 pounds per tree, it would fall in another year to a little over two pounds. The value in money depended, of course, on the market, but at an average price of 1*s*. 6*d*. per pound the extreme yield per tree varied from 39*s*. to 3*s*.

The fluctuations in the yield of one and the same tree in different years are, therefore, very considerable, and they remain up to the present inexplicable, "since the officers under whose personal supervision these experiments were made have not been able to find out any reasons for, or causes of, these very material fluctuations."

There is another point of practical importance. It is well known that *Ficus elastica* will grow with undiminished rapidity and luxuriance in situations remote from the hills, but in such localities it fails to yield caoutchouc. Hence, Mr. Mann concludes that no greater mistake could be made than to start plantations of this tree in the plains of Bengal. This is true also of many parts of the world where the tree has been introduced. In spite of the abundance of the tree under cultivation in the tropics of both the Old and New World it has nowhere proved valuable for the production of rubber except in the mountainous parts of Assam.

Owing to doubt as to the financial results of the cultivation of *Ficus elastica*, even in Assam, the work undertaken by the Government of India has latterly been suspended. In fact, no extensions have

been made since the year 1893-94. The total area of the plantations already established is estimated at about 2000 acres, but it is admitted that many parts are not fully stocked.

Great difficulty has been experienced in preserving the trees from illicit tapping by the natives even in the reserves. "It is rare to find a vigorous tree of any sort, and then it is invariably too old to yield rubber in quantity." The present position of the rubber industry in Assam is very fully discussed in a "*Note on an Inspection of Certain Forests in Assam*," by Mr. H. C. Hill, Officiating Inspector-General of Forests, dated the 31st March 1896. From this note the following extracts are taken :—

The continued destruction of naturally-grown rubber trees and the impossibility of preserving them.—The illicit tapping of trees in reserves, sparsely scattered over miles of almost impenetrable evergreen forest with an undergrowth of cane, is easily explained. The roughly collected impure rubber sells at a rupee a seer, and to obtain a number of seers which are interchangeable for 12 times their weight of rice at the nearest Koya's shop, a man has only to make his way to a tree, make cuts in the roots, and returning three days later collect his spoil. No system of inspection paths or staff of patrols would render protection effective over a block of forest of 200 square miles, such as the Bálipara and Charduar reserves, south and west of the Bhoroli river, with perhaps 10 or 20 trees to the square mile in the richest parts, even if men could be got to stay in the forests in the rainy season. Under existing arrangements the tapper works in the rains when all guards are withdrawn. The northern boundary abuts the Akha and Duffla hills and is uninhabited and trackless except for wild elephant paths, therefore the rubber once collected is easily carried across the line to be reimported as foreign produce. Formerly, when the right to collect rubber within Government forests other than reserves and to import from foreign territory was leased, gangs of Nepalese employed to collect rubber beyond the Inner Line defied the forest staff, and, assembling in numbers within the reserves, tapped everything before them. This began the destruction. Now, with fewer trees to work on, and licensed purchasers who pay the royalty of Rs. 12 on foreign rubber, illicit tapping goes on and the rubber is passed off to licensed purchasers as foreign rubber. The result is the continued destruction of the trees in reserves as well as in unclassed forests. And, if this is the state of things within the Inner Line, it may be safely concluded that the trees are being generally killed off across the Line, unless the reported religious regard for the tree in the Abor hills is affording it protection in that country. . . .

Plantations are the only means of assuring a continuous rubber supply.—The quantity of rubber exported from Assam annually at present amounts, in round numbers, to 3500 maunds, worth in Calcutta 3½ lakhs of rupees (35,000*l.*). The Government royalty at Rs. 12 a maund amounts to Rs. 42,000 (4200*l.*) a year, and it will, I think, be admitted that, with a view to making this supply continuous it behoves Government to invest a fair proportion of these receipts, if they can be profitably invested, with this object in view. The only prospect of success, financial or other, seems to be in the direction of artificial plantations, where the trees can be concentrated on a limited area, the effective protection and exploitation of which will be possible.

Financial prospects of the plantations.—Can these plantations be expected to become a profitable investment? Hitherto the Government

of India, acting on the advice of the Inspector-General of Forests, who had consulted the local officers (Messrs. McKee and Campbell), decided in 1894, that the further extension of the plantation was not advisable because a considerable amount of expense would be incurred, and there was a great doubt whether the expenditure would prove remunerative; and further because, even if it were remunerative, many years must elapse before any profits could be obtained. My observations and an examination of the plantation and of the facts connected with the rubber supply of the future may not justify the expectation that the Government will reconsider their decision of 1894; but as both Mr. Smythies and Mr. Home, who have followed Mr. McKee as Conservator in Assam, are more hopeful of the financial prospects of the plantation and express doubts as to the wisdom of the orders passed, I venture to put forward a further forecast of results which it seems to me may be safely anticipated.

In the first place, the cost of establishing the plantation was estimated in 1879 at Rs. 36 per acre. Mr. McKee's estimate of 1893 was Rs. 50. Mr. Smythies was of opinion that Rs. 20 would suffice for planting out an acre, and adding Rs. 10 for maintenance the cost would be Rs. 30. Mr. Home's estimate is Rs. 40 an acre for planting with maintenance. In my opinion this cost-rate will suffice and should not be exceeded, and where open lands are planted, as in 1892–93, the cost may be estimated at Rs. 30. Mr. Home is able to show that, exclusive of Rs. 34,000 spent on experiments, the existing plantation has cost Rs. 59 per acre, and with the experience gained there can be little doubt but that operations will be cheaper in the future.

The prospective yield of the plantation is discussed at length in paragraphs 9 to 15 of Mr. McKee's report, but it would seem that some assumptions have been made too unfavourable to the plantation.

Trees have been put out in the older compartments 100 feet by 25 feet apart or to the number of 17 trees to the acre. In the younger compartments the trees are spaced 70 feet by 35 feet or 18 to the acre. It has been assumed that half the trees would disappear and only seven or eight remain per acre, on the score that the average lateral spread of 50 natural trees being 94 feet, they cover an average of 980 square yards. This is apparently a mistake for 770 square yards, and as now planted, the trees might have an average diameter of crown of $\frac{70' + 35'}{2} = 53$ feet and cover 245 square yards. I think it may reasonably be held that more than eight trees, but with a less superficial area than $\frac{4840}{8} = 605$ square yards, will be permanently maintained. But admitting that an acre with eight trees or more will only yield 40 seers at a tapping, which may be repeated every five years, the net value of the rubber is very much understated by Mr. McKee. Instead of Rs. 50 it should be Rs. 80 per maund, and the return per acre per annum thus becomes Rs. 16 instead of Rs. 10. If the Rs. 40 initial outlay are taken at 50 years at $3\frac{1}{2}$ per cent. compound interest to mount up to Rs. 220 and interest at $3\frac{1}{2}$ per cent. paid on this out of the Rs. 16, there would still be a net return of Rs. 8 per acre per annum.

In order to ascertain what prospect of yield the plantation gives at present, I had four good trees tapped. Their age is 18 or possibly 20 years, as the old trees date from 1875, and the first compartments were only successfully planted in their present completeness in 1877–8. They yielded respectively 23, 21, 11 and 48 chittacks (approximately equivalent to 3, 3, $1\frac{1}{2}$ and 6 lbs.).

This was valued locally at Rs. 97 a maund, and allowing for some further drying and a fair rate for collection, the net value may be taken at Rs. 80 (a little over 1*s.* per pound).

The rubber was sent to Dr. Watt with a view to his obtaining an independent valuation in Calcutta. The result of this valuation is Rs. 105 to Rs. 108, Rs. 100 to Rs. 105, Rs. 110 to Rs. 115, Rs. 110 to 112 respectively, per bazaar maund landed in Calcutta (equivalent to an average price of 1*s.* 6*d.* per lb.).

One man taps three trees in a day or collects the rubber from two trees, so that 15 men would tap and collect the rubber from an acre containing 18 trees. Allowing a margin, the collection should be done for Rs. 10 a maund. The yield varies with the spread of the crowns and the more or less openness of the situation. The smallest yield was obtained from an enclosed tree in the middle of the compartment : the largest from a tree open on two sides situated on the bank of the Mansiri river. Previous tappings had been confined to the least vigorous and most suppressed trees in the lines, and hence the rubber obtained gave no indication of the yield of the plantation, the dominant vigorous trees of which alone yield rubber freely.

I think the yield obtained from these few trees justifies the assumption that 20 seers (11 lbs.) could even now be obtained from an acre, and that it is reasonable to suppose a maund will be readily obtained at or before the age of 50 years, and that Rs. 16 per acre per annum can be counted upon.

Extension of plantation work.—If these views are accepted, there would seem to be a good case for extending the plantation by 250 acres a year, at a cost of Rs. 10,000, for the next 12 years at least. By this time it will cover an area of 5000 acres, the prospective yield of which would be, even according to Mr. McKee's estimate, 1000 maunds of rubber per annum, adding a net income of at least Rs. 80,000 to the forest revenues of the province.

Cost to Government and the possibility of increasing the duty.—As already shown, Government is only required to forego 25 per cent. of the revenue it is now deriving from the extermination of the natural rubber trees.

Considering that men are ready to pay up to Rs. 38 a maund for rubber collected from the forests in the Tezpur district, with a guaranteed yield of 168 maunds from one of the two mahals (eastern) into which the district has been divided, it may be desirable to raise the royalty from Rs. 12 to Rs. 20 a maund. This would still leave an ample margin for profit, since the cost of collection and carriage varies from Rs. 16–8 in the Garo Hills to Rs. 30 paid by mahaldars.

DXXX.—GERMAN COLONIES IN TROPICAL AFRICA AND THE PACIFIC.

Some particulars respecting the development of agriculture in German Tropical Africa were given in the *Kew Bulletin*, 1894, (pp. 410–412). The Foreign Office has now published a further report (Miscellaneous Series, No. 402) on the "German Colonies in Africa and the South Pacific," by Mr. Martin Le M. Gosselin, C.B., H.M. Chargé d'Affaires at Berlin.

The Colonies dealt with comprise :—

(1.) Togoland lying east of the British Colony of the Gold Coast;

(2.) The Cameroons in the Bay of Biafra opposite the Spanish Island of Fernando Po;

(3.) German South-West Africa between the Portuguese Colony of Angola and Cape Colony;

(4.) German East Africa extending from Cape Delgado northward to Wanga, nearly opposite the island of Pemba and reaching inland to Lakes Tanganyika and Victoria Nyanza;

(5.) German New Guinea or Kaiser Wilhelmsland, including Bismarck Archipelago; and

(6.) Marshall Islands, a small group lying north of the Caroline and Gilbert Islands in the latitude of the Philippines.

The following table will show the extent and trade of these Colonies :—

Colony.	Area. Square Kiloms.	White Population.	Volume of Trade. (Imports and Exports combined.)
			£
Togoland - - - -	60,000	96	256,751
Cameroons - - - -	495,000	230	520,316
German South-West Africa -	835,100	1,114	101,303
German East Africa - -	995,000	600	593,322
German New Guinea - -	250,000	198	—
Marshall Islands - - -	400	81	—
Total - - -	2,635,500 = 1,016,782 English square miles.	2,319	1,471,692

Of these colonies Togoland is the only one that so far pays it way.

In the work of maintaining the government of the other colonies there is estimated to be a deficit for the year 1896–7 of 473,502*l.*, to be met by Imperial grants in aid.

The German colonies have not as yet attracted many settlers from the Fatherland. The opinion is expressed in the report that they are still in a great measure in the position of undeveloped estates of unknown value; a great deal has already been done with the most praiseworthy perseverance to open up the countries entrusted to German rule and civilisation, but, except in parts of South-west Africa, it appears certain that none of the colonies are suitable for actual colonisation by Europeans. Manual work can be supervised and directed but not undertaken by the white settler. They may and probably will become great trade centres for the development of German transmarine trade, but will not serve as agricultural colonies in which the surplus population of Germany can be absorbed.

I.—Togoland.

This was the earliest of the German possessions on the coast of West Africa. The white population is almost entirely German, consisting of

22 officials, 25 traders, and 22 missionaries. The following particulars are given of the plants cultivated in the colony :—

"Amongst the trees and shrubs acquired some years since from the botanical garden at Lagos, the Annatto plant, *Bixa Orellana*, yielding a red dye, and various sorts of *Eucalyptus*, have thriven very well. The cocoa-nut plantations at Lome, Bagida, and Porto Seguro are also thriving. Attention is being paid to the cultivation of indiarubber trees and it is anticipated that the imported *Manihot Glazovii* will do better than the native sorts.

"The Liberian coffee trees do well, and the coffee plantations have been largely extended during the 12 months, July, 1894, to June, 1895, one native firm (the Brothers Almeida) having now 25,000 trees and 50,000 seedlings. Some 300 kilos. of coffee were exported as a sample crop, and realised at Bremen 1*s.* 7*d.* the kilo. This year the same firm hope to export 2 tons.

"At Klein-Popo 30,000 coffee trees have been planted, about one-fifth of which bore fruit this year, and a small consignment (60 kilos.) was exported. The Arabian coffee trees have been attacked by disease, which does not, however, affect the Liberian trees, even when in the closest proximity.

"Many European vegetables are doing fairly well in the Government gardens at Sebbe (endives, carrots, cabbages, celery, radishes, &c.), and some specimens of the so-called Otaheite potato (*Dioscorea sativa*) have been obtained from the Gold Coast botanical gardens."

The following table shows the trade returns of the principal articles exported during the last two financial years—

Articles.	—	Quantity.	
		1894–95.	1893–94.
Palm nuts	Kilos	8,428,159	7,095,893
Palm oil	Litres	2,766,132	2,821,093
Gum	Kilos	41,183	23,349

The export of gum has nearly doubled itself, that of palm nuts shows an increase of over 1,000,000 kilos., while the amount of palm oil has somewhat decreased.

"The total value of goods exported (July, 1894, to June, 1895) amounted to 107,317*l.*"

II.—Cameroons.

This has a total area of 495,000 square kilometres, equal to 190,972 English square miles, or about the size of Spain.

This immense tract has a white population almost stationary at about 230.

The principal articles cultivated for food, and the forest products exported, are noticed in the following extracts :—

"Many European vegetables (cabbage, carrots, salad, beans, and cucumbers, &c.) do well in the outskirts of Kamerun, and Europeans will soon be able to dispense with tinned (imported) vegetables.

"The trade in the chief products of the Cameroons, oil, palm nuts, indiarubber, and ivory, is still suffering from the fall in prices quoted on the European markets for such goods. A gradual change is being effected in the inland trade; formerly the export goods passed from tribe to tribe, and eventually only reached the European firms through the native middlemen on the coast; now the firms despatch caravans every month from eight to 10 days' march into the interior, and exchange European imports for ivory and indiarubber.

"The unsatisfactory middleman is thus being abolished, which is doubtless an advantage; but the cost price is much the same now as formerly, in consequence of the expense in carriers, almost all Wey-men from Liberia.

"The botanical gardens at Victoria continue to render valuable service; the Arabian coffee tree thrives very well, while the Liberian coffee tree suffers—especially in the rainy season—from a mouldy growth. (As stated above, in the neighbouring colony of Togoland, it is the Liberian tree that thrives, and the Arabian that has been attacked by disease.) Clove trees (*Caryophyllus aromaticus*) do well, and are already 50 centimetres high. Ten Para gum trees (*Hevea brasiliensis*), which yield the best indiarubber, have been planted, and are thriving admirably. Ginger does well, the first crop, 5½ centners, having been sent to Hamburg, and realised good prices. Large plantations of Jamaican and Canton ginger will consequently be made this year. The nutmeg (*Myristica moschata*) has not thriven, probably on account of the dry climate. On the other hand, black pepper does very well.

"During the year the botanical garden shipped:—

Articles.	Quantity.	Value.
	Kilos.	£
Cocoa	3,101	208
Coffee	533	40
Ginger	270	5
Coffee and vanilla samples	11·5	1
Total	—	254

"The garden further supplied a great quantity of seeds to the various European planters and missions.

"The Bibundi plantation, worked by three whites and 240 coloured labourers, has already 44,500 cocoa trees. In 1893–94 the cocoa crop was 78 centners; in 1894–95, 200 centners. The tobacco crop, on the contrary, fell off from 110 centners in the former to 60 centners in the latter year. The Havannah tobacco plants, the best in quality, do not yield so heavy a crop as the Surinam plants.

"Similar progress is reported from the other plantations.

"The value of goods exported during 1894–95 amounted to 204,056*l.*, as compared with 238,707*l.* in the previous year, showing the diminution of 34,651*l.*

"The following table shows the details of export during the years 1893–94 and 1894–95:—

Year.	Palm Oil.	Palm Nuts.	India-rubber.	Ivory.	Ebony.	Cocoa.
	Litres.	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.
1893–94 - -	3,600,139	5,960,399	448,883	30,484	507,041	110,905
1894–95 - - -	3,362,082	5,837,608	343,150	40,822	479,385	120,069
Increase or decrease	− 238,057	− 122,791	− 105,733	+ 10,338	− 27,656	+ 9,164

"The fall is attributed partly to the bad prices obtained in European markets for West African produce, and partly to six months of exceptionally dry weather. As illustrating the first cause, it is recorded that, on January 8, 1895, a ton of Cameroons oil realised in Liverpool only 20*l.*, as compared with 23*l.* on the same day in 1894; similarly palm nuts realised at the same dates and market 9*l.* 11*s.* 3*d.* and 11*l.* 10*s.*

"So keen is the competition between the several export firms, that in spite of the fall in prices, they do not dare to reduce the purchase prices paid to the natives. Until the firms pull better together, the report sees no chance in reducing the purchase prices to which the natives are accustomed."

III.—German South-West Africa.

The area of this Colony is 835,100 square kiloms. or nearly twice the size of the Cameroons. There are 780 Germans, of whom about 500 are in uniform. The British subjects are nearly as numerous as the German, with a sprinkling of Trek and Transvaal Boers.

"Exports from Walfish Bay to Cape Town of Articles over the Value of 1000 marks (50*l.*).

Articles.	Value.
	£
Narrah kernels - - - - - -	695
Hides - - - - - - - -	1,689
Ostrich feathers - - - - - -	1,551
Goat skins - - - - - - -	839

The "Narrah" kernels above mentioned are the seeds of the Naras plant (*Acanthosicyos horrida*, Welw.), a cucurbit, yielding an edible fruit, covering large tracts in Angola and Dammaraland.

IV.—German East Africa.

The area is nearly a million square kiloms., or 383,873 square English miles. This is undoubtedly the most valuable of any of the German Colonies, but it is still in a very undeveloped state. The races to be governed are Negroes, Arabs, and East Indians. In some localities

the British East Indians are far in excess of all the other coloured people. The following particulars are furnished in the Report :—

"The effects of the visitation of locusts in 1893–94 were still visible in the year under review. Many formerly fruitful districts were completely devastated; the locusts especially attacking rice, Indian millet, and maize; the natives are now advised to replace these crops with plants which the locusts do not touch, such as manioc, sweet potatos, and various sorts of beans. In the non-devastated regions, last year's harvest has been good.

"Cattle rearing has not materially improved; whether the rinderpest is partly the cause of this is not certain; but undoubtedly the locusts and the famine have retarded progress. Good fodder could only be obtained from the islands of Mafia and Kilwa-Kissiwani, and from the Kilimanjaro highlands.

"*Plantations.*—The reports of the cocoa-nut, india-rubber, vanilla, and coffee plantations, were generally satisfactory.

"The cocoa plantations of the German East Africa Company at Moa and Yassini, embrace some 18 square kiloms.; 80,000 to 85,000 cocoa-nut palms have been planted, besides a quantity of seedlings, and the Director calculates that by July 1896, 500,000 trees will have been planted out. The same Company's coffee plantations, Derema and Nguelo, at Handei, in the Usambara Hills, yielded last harvest a crop of about 50,000 kiloms., and it is said of excellent quality. At Derema in June 1895, there were between 150,000 and 160,000 Arabian coffee trees, and some thousands of Liberian trees. At Nguelo some 350,000 trees. From 600 to 700 labourers are employed, amongst them 200 Chinese and Malays. The *Hemileia vastatrix* appeared in 1893–94, but fortunately has not hitherto done much damage. Dr. Heinsen, the botanist, specially sent to East Africa to stamp out this disease, has tried several means of doing so (the report does not specify them), nor is it yet known whether the experiments have succeeded.

"200 acres of land have been planted with tobacco at Lewe, and 2500 with coffee; but it is not intended to plant more tobacco, as the quality does not come up to the mark. From 100 to 120 Chinese and Javanese are employed at Lewe, besides 100 (and in the busy season 400) Bondei men. The health of the Asiatic coolies is said to be good.

"The cotton plantations at Kikogwe, though thriving well, do not pay, both on account of Indian competition, and of the heavy fall in the prices realised in Europe. A pound of cotton, equal to the best Texas cotton, only fetched in Hamburg 26 pf. ($2\frac{1}{2}d.$), while formerly from 43 to 47 pf. were constantly realised.

"In the Bagamoyo district, the prosperous vanilla plantations of the Fathers of the Holy Ghost, started many years ago, deserve a passing notice; but these plantations are of course exceptional, being worked by the pupils, who are fed, clothed, and housed at the mission's expense.

"Sugar plantations are chiefly to be found in the Pangani Valley.

"*Government assistance to agriculture.*—The Government will doubtless do much in the way of experimental cultivation, now that a new agricultural department is being organised, but a good deal has already been done in this direction.

"For instance—

"1. Every half-year a quantity of vegetable seeds are supplied to all stations, both inland and on the coast, inhabited by Europeans. Inland,

nearly all European vegetables do well. Wheat has been successfully cultivated at Tabora: 600 kiloms. inland. Sample sacks of Tabora wheat, quite recently forwarded to Berlin, are said to have made excellent flour, quality and colour good, and very nutritious. The stations are further supplied with all tropical fruits, and with such trees as are likely to thrive (cedar, *Pinus excelsa*, acacia, and eucalyptus). The assistance rendered in this respect by the Director of the Indian Forests Department, by the botanical gardens at Natal, Rockhampton (Queensland), and Calcutta, is gratefully noticed in the report, and the thanks of the Government are expressly conveyed to these and other foreign and German benefactors.

"2. A portion of the special grant of 2500*l.* voted in June, 1895, by the Reichstag for the relief of the famine, as well as the funds collected at Zanzibar for the same end, was expended by the Administration in providing the natives with grain and seeds (maize, rice, beans, and ground-nuts), partly gratuitously, partly under the condition of returning double the grant after the first good harvest.

"3. An experimental plantation, 80 acres in extent, of Liberian coffee and tobacco, has been started at Mohorra, south of the Rufidji Delta.

"4. Silk culture has been started at Dar-es-Salaam, and it is hoped to obtain Indian experts to direct the experiment. 'Unfortunately the efforts of the Consulate at Bombay to find such people have been as yet fruitless, but it is hoped they may soon be engaged.'

"5. An experimental garden has also been started at Dar-es-Salaam, and an interesting table is annexed to the East African report, showing the countries of origin and dates of arrival, planting, and sprouting of no less than 273 different sorts of plants, together with a further list of those plants which would appear to do best. These tabular statements would doubtless be of great service to any horticultural or arboricultural undertaking on the East Coast.

"6. A station has been founded in the Upper Usambara Hills, to test whether the Highlands could be utilised for German colonisation.

"7. A forestry ordinance was issued by Major von Wissman in October 1895, for protecting the woods in the Usambara district. According to this regulation, the woods for 150 metres wide on the hill ridges can only be touched by special permission of the Government. Hill-sides above an angle of from 45 to 50 degrees may not, under any circumstances, be disafforested. In the valleys, woods are to be left 30 metres wide, every 600 metres, at right angles with the lay of the valley; along the brooks the woods are to be left for a space of 50 metres wide (either on both or on one side). Intentional contraventions of the above are punishable with fines up to 6000 rs., or 3 months imprisonment; unintentional contraventions with fines up to 1000 rs.

"8. By an Ordinance, dated July, 1894, the then Governor, Herr von Schele, forbad the preparation of 'tembo' (or palm wine) in East Africa, in order to prevent as far as possible the damage done to the cultivation of palms by the preparation of this drink. Contraventions were punishable by fines up to 50rs, or 1 month's imprisonment.

"This Ordinance, being found to be unworkable, was abrogated in October 1895, but the district officials are instructed to do all in their power to discourage the preparation of 'tembo'; and it is suggested that the sale of this drink should only be allowed to duly authorised persons who should have to take out a license for the same.

"The commercial state of the Colony in 1894-95 was 'not unfavourable,' when the locust plague, and consequent famine, and the fall in the rate of exchange on the rupee are taken into consideration."

"The result of the locust plague is all too plainly to be seen in the export returns of food stuffs:—

Articles.	Value in 1000 Dollars.		
	1892.	1893.	1894.
Rice, unpeeled - - -	33	35	9
" peeled - - -	60	121	16
Maize - - - -	6	7	—
Negro corn (matama and mawele)	56	84	53
Chiroko - - - -	3	4	2

"The same decrease is noticeable in the report returns of cattle, sugar-syrup, and molasses.

"On the other hand, exports not affected by locusts show an increase:—

Articles.	Value in 1000 Dollars.		
	1892.	1893.	1894.
Raw caoutchouc - - -	211	232	247
Cocoa-nuts - - -	31	36	44
Sesame - - - -	47	44	80
Tobacco - - - -	37	30	101
Grass for plaiting - -	9	13	24

"The only exception is copra, the quantity exported in 1894 being 30,000 dols. less than in 1893.

"The great volume of the East coast trade still finds its way to Zanzibar. According to the returns drawn up there the value of the goods imported into the island in 1894 from the German coast amounted to no less than 3,980,390 rs., and the goods exported thence to the German coast to 3,739,339 rs."

[The following extract from a despatch to the Foreign Office, gives the most recent account of the progress made in the cultivation of Tropical staples in German East Africa.

MR. GOSSELIN to the MARQUESS OF SALISBURY.

(No 120. Africa.)

MY LORD, Berlin, July 9, 1896.

THE German East Africa Company have recently issued their Annual Report for 1895

The Handei Hills coffee plantations are doing well, and have withstood the ravages of the *Hemileia vastatrix* fairly well, and the first harvest (1895-96) realised some 1700 centners; the best quality was sold on the average for 1·10 marks per ½ kilog. (the duty being paid by the purchasers). A great increase is anticipated in the next harvest, as a number of newly-planted trees will make a return for the first time. From 500,000 to 600,000 coffee trees are already planted, without counting some hundred thousands of cuttings.

Tea plants are doing well at Derema, but it is too early yet to give an opinion as to the result. If the cultivation of tea is to succeed on the East African littoral it will, says the Report, be necessary to obtain the assistance of Chinese and Javanese coolies, and the hope is expressed that the Imperial Government will facilitate the importation of coolie labour from East Apia.

Some former Wanyamwezi and Wasukuma porters have recently done well in the plantations, and an agent has been dispatched to the interior to enlist labourers for the company and other agriculturists in the Usambara district.

The cocoa cultivation at Derema has not been a success, the plantations being too high up on the hills. The cocoa plantations at Muoa, where some 3600 hectars have been planted close to the sea, are thriving well.

At Kikogwe the outlook is less satisfactory; the market price of cotton, being now so low it has been found necessary to supplement the cotton plantations with other crops, notably, Liberian coffee, Chiroko beans, maize, Mtama millet, and it is anticipated that little by little the cotton should be replaced by coffee, cocoa, and Sisal hemp. Mr. Cowley, who started the Handei Hills plantations, has been appointed manager at Muoa.

I am, &c.

The Marquess of Salisbury, K.G.] M. Le M. Gosselin.

V.—Kaiser Wilhelmsland.

This includes German New Guinea and the Bismarck Archipelago, with an estimated area of 250,000 square kilometres or about one half the size of the Cameroons.

"The great event in the history of the colony this year is the Bill laid this session empowering the Imperial Government to take over the administration of Kaiser Wilhelmsland.

"The following notes are taken from the Memorandum submitted to the Reichstag last month (May, 1896) in support of this measure.

"In the three West African Colonies sovereign rights have been exercised ever since the annexation by the Emperor in the name of the Empire.

"In East Africa, the German East Africa Company acquired sovereign rights by the Imperial Letter of Protection of February 27, 1885; but these were given up in 1890, and the sovereignty of the Protectorate was vested directly in the Empire.

"In New Guinea, the sovereignty was accorded to the New Guinea Company by the Imperial Letters of Protection of May, 1885, and December, 1886; the Company was acknowledged as a Corporation, and acquired juridical rights in May, 1886, and, except from November, 1889, to September, 1892, has since carried on the government of the scattered colony.

"During the 1889–92 interval a special arrangement was tried, under which the Government found the officials, whilst the company paid the salaries; but the plan did not work well, and, in September, 1892, the company again undertook the administration.

"The company have found great difficulty in recruiting their staff, and finding people able to act as officials, and, at the same time, possessing that practical knowledge required for trading or plantation purposes. This was specially the case when, through death or illness, an appointment had to be suddenly filled up. Vacancies were thus left unprovided for months, to the manifest disadvantage of all concerned.

"The official memorandum proceeds to give a glowing account of the fertility and richness of the whole colony, of the abundant water supply, and of the success attained in the cotton plantations.

"The fauna of the island is remarkably poor in mammals, very rich in birds. Beasts of prey and poisonous reptiles are unknown. The natives rear pigs and dogs, but no other domestic animals were known till the arrival of the Germans.

"*Cotton Crops.*—The cotton crops on the Gazelle Peninsula were good, and of excellent quality. In the Herbertshöhe plantations, 60 bales (about 25,000 lbs.) were ready for exportation in July, 1895; in the Ralum plantation, 120 bales (41,000 lbs.), and the crop was by no means ingathered when the report was written."

VI.—Marshall Islands.

This remote group of islands is situated almost in the middle of the Pacific. It is of very slight commercial importance, but the account given of a visit to Nauru by the Imperial Administrator furnishes some facts of interest.

"The chief occupation of the natives is the collection and preparation of copra, the staple export of the archipelago. They are excellent fishermen and swimmers. The women make preserves, mats, and other such articles. Many of the men have become very serviceable sailors, so much so that the vessels of the Jaluit Company, with the exception of the captains and pilots, are exclusively manned by the Marshall Islanders. The boldness of the crews of the native schooners, navigated in the open seas without any nautical instruments, by the help of the most primitive and, to Europeans, unintelligible of nautical charts, is astonishing. On land, and as domestic servants, the natives are less satisfactory, though even here an improvement is visible. Want of application and perseverance is, after all, a necessary outcome of the nomad lives they have hitherto led.

"The old patriarchal system still prevails amongst the natives. On the other hand, by contact with the whites, they have lost many of their primitive originalities, most of all in Jaluit, where the old-fashioned grass-coats and hair-tufts are now seldom to be seen. The old war-drums of sharks-skins, formerly beaten by the native women, are things of the past, and are now eagerly sought for by collectors of curiosities. The natives of the Rataks, of the northern Raliks, and especially of Nauru, have kept up more of the old habits and customs, and the love of fighting. The fact that peace has been maintained, in spite of this feeling, throughout the colony is due, not so much to a change in the native character, as to a whole series of regulations, amongst which, in the foremost place, should be reckoned the prohibition of the sale of arms and spirits. Another measure which has tended greatly to preserving the peace is the decree forbidding the selling of goods to natives on credit.

"The price of food-stuffs is high, due to the remoteness of the islands, to the dearness of labour, and to the hitherto prevalent system of allowing long credit.

"*Products.*—The indigenous products of the islands were limited to cocoa and other nuts, pandanus, bread-fruit, taro, arrowroot, bananas, and various goods.

"The natives are learning the value of the bananas and melons, but the place once held by the cocoa-tree as the staff of life is being gradually

replaced by imported rice and preserves. Last year's yield of copra was very rich; the natives have planted young trees, in accordance with regulation of September, 1894, which should bear a full crop in some 10 years' time.

"The plantation at Likieb, the joint property of an American, a German, and a Portuguese, yielded 210,000 lbs. copra in 1894–95, and 25 fresh hectares were planted.

"Attached to the plantation is a small ship-building yard, which turns out excellent sailing-boats used by the Marshall, Caroline, and Gilbert natives. The material has all to be imported by the Jaluit Company 'as the cocoa-nut wood breaks like glass.'

"The Jaluit Company's plantations at Providence and Killi are also thriving.

"The total copra yield amounted during the year 1894–95, to 4,730,259 English lbs. as compared with 4,767,169 English lbs. in the previous year. Almost all the isles showed an increased yield excepting Nauru, where, on account of the drought, the crop fell from 421,000 lbs. to only 31,509 lbs.

"There are three experimental gardens at Jaluit, where several European vegetables (such as salad, tomatos, cucumbers, radishes, &c.) do well, but good soil is so scarce, having to be imported as ballast, that extensive cultivation is out of the question.

"Pigs are the only animals reared for food purposes on the islands, there being no fodder for cattle or sheep; cattle and sheep are occasionally imported, but have to be killed at once for want of green food. There is no wild game."

"*Nauru.*—The Imperial Administrator ('Kaiserlicher Landeshauptmann'), Dr. Irmer, made a voyage to Naura (formerly known as Pleasant Island) in August, 1894, and his report furnishes some interesting information on the inhabitants of this isolated spot.

"There is no harbour, and ships cannot even anchor off the shore, the coral reefs being unusually steep.

"Nauru, lying almost on the equator fully five degrees south of Ebon Isle, the southernmost of the Ralick Marshall Isles, is reported to be, without doubt, the most beautiful and, in rainy years, the most fruitful of the whole protectorate.

"From January, 1892, to shortly before the Governor's arrival, no rain to speak of had fallen, and the copra harvest of 1893 was consequently lost. Some of the cocoa-nut trees produce the almost incredible number of from 1200 to 1500 cocoa-nuts. The distress in consequence of the drought was so great that the copra tax had to be suspended, and the trading licenses reduced by half.

"The islet, only some 10 marine miles in circumference, rises in terraces of coral formation from the sea, the highest ground being some 50 to 60 metres from the sea-level.

"As a guide to ships a flag-staff has been erected on the highest point. The high ground is wooded. Near the centre is a fish-pond with brackish water, surrounded by a palm grove of magnificent trees from 80 to 100 feet high.

"The picturesque village lies close to the shore, half being built on piles in the sea.

"Attached to each house is an inclosure with tame sea-swallows and other large marine birds. The feathers were formerly exported to the Marshall Isles to adorn the hair and ears of the natives, and dress their canoes, but this trade has now ceased, the birds being still kept to amuse the children.

"Pigs are also to be found and dogs, the latter are not kept for protection, but as dainty morsels at great feasts.

"The sea inside the reef, some 15 feet deep, is very rich in mud, and is divided by moles separating each marine property. The fish, hardly the length of a finger when caught, are fed up till they attain the size of a fat herring, and are then eaten raw, and they are said to be delicious.

"Behind the village is a deep cavern, access to which is gained by a shaft some 70 feet deep by means of ropes; below is a fresh-water lake domed in by a stalactite formation. Beyond this cave is a further abyss of unknown depth and extent. The cave, which extends far under the sea, will, when explored, probably yield much of interest to marine life and science.

"The presence of singing-birds was noted with delight by those coming from the Marshall Isles where none such exist. An attempt to import them to the other isles failed, as they die at once in captivity."

DXXXI.—MISCELLANEOUS NOTES.

MR. MARMADUKE ALEXANDER LAWSON, M.A., F.L.S., Government Botanist and Director of Cinchona Plantations to the Madras Government, died at Madras on February 14th last. From 1868 to 1882 he held the posts (now divided) of Sherardian Professor of Botany and Sibthorpian Professor of Rural Economy in the University of Oxford. In that year he was appointed, on the recommendation of Kew, by the Secretary of State for India in Council, Director of Government Cinchona Plantations, Parks, and Gardens, Nilgiris.

In 1885 a Botanical Department for the Presidency was created, and Mr. Lawson was appointed its head, with the title of Government Botanist and Director of Cinchona Plantations.

The official record by the Acting Government Botanist, and the minutes of the Madras Government (dated July 23rd) are given below.

EXTRACTS from ANNUAL ADMINISTRATION REPORT on the GOVERNMENT CINCHONA DEPARTMENT, NILGIRIS, for the Year 1895–6.

It is with great regret that the death of Mr. M. A. Lawson, Government Botanist and Director of the Cinchona Plantations, has to be recorded. Mr. Lawson assumed charge of the Cinchona Plantations and Government Gardens and Parks on the 18th June 1883, and the designation of Government Botanist and Director was given to him on the 1st April 1886. Mr. Lawson had unusual ability, which he exhibited in every department of his office. In January 1895 he intimated his intention to retire from service, and at the close of the year his health, which had been most robust during the whole of his Indian career, began to fail. In February last he reluctantly placed himself under medical care, and was removed to Madras, where he died after an operation on the 14th February 1896 (p. 9).

His Excellency the Governor in Council desires to record his high appreciation of the work done by the late Mr. Lawson as Director of the Government Cinchona Plantations during a period of over 12 years. From the report of Dr. King, who has inspected the plantations on two occasions prior to 1884, it is clear that their condition has greatly improved during Mr. Lawson's tenure of office, a result which is to be ascribed to his administration (p. 23).

Mr. John Christopher Willis has been appointed on the recommendation of Kew to succeed to the post vacated by Dr. Trimen as Director of the Botanical Department, Ceylon. Mr. Willis is M.A. of Gonville and Caius College, Cambridge, and held for three years from 1890, the Frank Stuart Studentship for botanical research. At the time of his appointment he filled the posts of Senior Assistant to the Regius Professor of Botany in the University of Glasgow, and of Lecturer in Botany at Queen Margaret's College in that University. Mr. Willis left England for Ceylon on the 21st August last.

Mr. George Herbert Cave, a member of the gardening staff at Kew, has been appointed by the Secretary of State for India in Council, a gardener on probation on the staff of the Royal Botanic Gardens at Calcutta. Mr. Cave had served as sub-foreman in the Propagating Pits. He left London for Calcutta on the 18th September last.

Botanical Magazine for August.—All the drawings were made from plants cultivated at Kew. *Sansevieria roxburghiana*, native of the East Indies, is interesting as a fibre-yielding plant. It was presented to Kew by Messrs. James Veitch and Sons. *Cyrtanthus Huttoni* has been recently introduced from Cape Colony. The Kew plants were raised from seeds received from the Edinburgh Botanic Garden in 1892. *Sarcochilus hainanensis*, an orchidaceous plant from the Island of Hainan, was sent to Kew in 1894 by Mr. Ford, the Superintendent of the Botanical Gardens, Hong Kong. *Adonis amurensis* is a native of Manchuria and Japan. It is chiefly noteworthy for its handsome foliage. *Solanum cernuum*, a native of South Brazil, is about eight feet high, with large leaves and white flowers.

Botanical Magazine for September.—The plants figured are: *Chonemorpha macrophylla*, *Dendrobium Leonis*, *Bauhinia Galpini*, *Rhododendron Smirnovi*, and *Celmisia Munroi*, all being cultivated at Kew. The *Chonemorpha* is a vigorous climber, native of India and the Malay Islands. It was raised from seeds received from the Royal Botanic Gardens, Calcutta, in 1884. The stem, when cut, yields a milky fluid, which Mr. Gamble considers "a good sort of Caoutchouc." The *Dendrobium* is a curious species from the Malay Peninsula, whence it was first introduced into this country sixty years ago. The Kew plants were obtained from Mr. C. Curtis, F.L.S., Assistant Superintendent of the Garden and Forest Department, Penang. *Bauhinia Galpini*, flowered for the first time at Kew in 1895. It is a native of the Transvaal, where it was first discovered by Mr. W. Nelson, at Dorn Spruit Spelunken, in 1880. The *Rhododendron* is a handsome species from Trans-Caucasia, and was obtained from seeds received at Kew from Dr. Regel in 1866. *Celmisia Munroi*, native of New Zealand, was introduced by Messrs. J. Veitch and Sons. It is one of the finest species of the genus.

Flora Capensis.—The publication of the first part of Vol. VI. has already been noticed (p. 124). Part II. has since been issued with the following prefatory note by the Director :—

The second part of the sixth volume of the *Flora Capensis* needs but a few words of introduction. Like the first, it is the work of Mr. J. G.

Baker, F.R.S., the keeper of the Herbarium and Library of the Royal Gardens, Kew. It contains the continuation of the *Amaryllideæ* and part of the *Liliaceæ*, to the completion of which the whole of the third and concluding part will be devoted.

Most of the genera described include species of great horticultural interest. This is especially the case with *Crinum*, *Nerine*, *Cyrtanthus*, and *Hæmanthus*, which belong to the former family, and with *Asparagus*, *Kniphofia*, *Gasteria*, *Aloe*, and *Haworthia*, which belong to the latter.

Two points suggest some remark. A considerable number of species appear never to have been collected but once. Many are still only known from descriptions and figures published in the last century, and are unrepresented in herbaria. It is difficult, however, to believe that any are really extinct. The fact is more probably accounted for by the extremely local limitation of species in South Africa, which is hardly paralleled in this respect by any other flora in the world.

In the case of succulent genera such as *Aloe* and *Haworthia*, herbarium specimens are lamentably deficient. But Mr. Baker has had the advantage of having had under observation for years the collection of succulent plants at Kew, which in extent is undoubtedly unique. Many of these have been, in all probability, under cultivation at Kew since their introduction in the last century. The advantage of consulting living specimens is of peculiar advantage in describing the Petaloid Monocotyledons. But in the case of the succulent genera, it may be safely said that, without it, the task would not be possible at all. Unfortunately when the majority of these plants were introduced, little importance was attached to their exact localisation; and this, therefore, for the present, must remain for the most part undetermined.

I have again to express my obligation to Mr. N. E. Brown, and to Mr. C. H. Wright, assistants in the Herbarium, for their valuable assistance in the work of passing the sheets through the press. And I must remedy an omission in expressing my thanks to the well-known South African botanist, Mr. H. Bolus, F.L.S., for great assistance in revising the very intricate topography.

W. T. T. D.

Kew, August 1896.

Hand-List of Trees and Shrubs. Part ii.—An account of the purpose and scope of this publication was given in the notice of Part I. in the *Kew Bulletin* for 1895 (pp. 40–42). The present part (Gamopetalæ to Monocotyledons) completes the catalogue of the ligneous plants (excluding conifers, which form a separate hand-list), grown in the open air in the arboretum of the Royal Gardens. In the nomenclature of hardy bamboos Kew has to acknowledge the kind assistance of A. B. Freeman-Mitford, Esq., C.B., of Batsford Park, Moreton-in-Marsh, who has made them a special study. Anyone interested in the cultivation of these beautiful shrubs cannot do better than procure Mr. Freeman-Mitford's admirable volume, "The Bamboo Garden."

Donation to the Herbarium.—Through the kind offices of Dr. A. F. Batalin, the Director of the Imperial Botanic Garden of St. Petersburgh, Kew, has received from that establishment a valuable consignment of dried plants, from various parts of the world. Altogether there are about 1,000 species, and those from Central Asia and North-western

China, collected by the eminent Russian travellers Potanin, Przewalsky and Regel, are particularly valuable.

New Forage plant.—The plant described in the following letter might prove useful in Australia, South Africa, and the cooler parts of India.

United States Department of Agriculture,
August 1, 1896.

DEAR SIR,

I FORWARD you to-day, enclosed in separate wrapper, a small package of seed of the Florida beggar weed (*Desmodium tortuosum* Swz.), a wild forage plant highly esteemed in the sub-tropical portions of the United States. It produces fodder of fine quality in large quantities, and grows best on sandy soils containing lime. On cultivated lands it grows often 8 to 10 feet high. The haulms, though rather woody, are eaten by cattle and working stock of all kinds. Beggar weed makes an excellent green manure. In Florida it is extensively used as a renewer of worn lands. It promises to be a plant of much agricultural value in the warmer countries.

Respectfully,
F. LAMSON-SCRIBNER,
Agrostologist.

The Director,
Royal Gardens, Kew.

Lemon and Lime trees as hedge plants.—In the *Annual Report* of the Department of Agriculture of Queensland for the year 1894–95, pp. 55–56, it is recommended to utilize the lemon tree (*Citrus Medica*, var. *Limonum*) as a hedge plant. For some years the lime tree (*Citrus Medica*, var. *acida*) has been so used in the West Indies with great success. The only drawback noticed in the use of the latter has been the occasional dying out of the trees in patches, due probably to the uncongenial nature of the soil. The same thing also occurs in old established yew hedges in this country. Apart from this circumstance, lemon and lime trees are capable of forming very serviceable hedges in tropical and sub-tropical countries. The paragraph mentioned is as follows :—

"The cutting up of large estates into small farms necessitates a large amount of fencing that was not before required. It is a considerable item in the expense of starting operations. The posts are generally to be found on the land or near by, but the time is fast coming when they will have to be brought from a distance. Everyone is cutting down, and nobody planting timber, with the resultant annihilation of the timber. To meet the difficulty, hedge planting will have to be resorted to, for which purposes no plant in the colony is so thoroughly adapted as the common lemon. If, where fences are being erected, or along existing fences, a few seeds were dropped in at about 18 inches apart, a hedge would in about four years be obtained, that no man or beast could penetrate. There is a row growing here, not quite five years old, with stems six and seven inches in diameter. Plants of course can be used instead of seeds. The raising of quickthorn for hedges in the old country is a business, and a similar business could be made of raising lemons here. A lemon hedge six or seven years old would require something in the way of a locomotive to punch through it."

D. BUCHANAN.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 119.] NOVEMBER. [1896.

DXXXII.—HIGHLAND COFFEE OF SIERRA LEONE.

(*Coffea stenophylla*, G. Don.)

With Plate.

The Highland Coffee of Sierra Leone (*Coffea stenophylla*) is an interesting plant, as being, according to the *Botanical Magazine*, t. 7475, "one of the two indigenous West African species* which in point of commercial value may prove a formidable rival of the Arabian coffee." It was discovered by Afzelius upwards of a century ago; but was not published until 1834, when G. Don described it from specimens collected by himself at Sierra Leone. Sir Joseph Hooker remarks:—"It was regarded by Bentham, perhaps rightly, in the 'Niger Flora,' as a variety of *C. arabica*."

The plant is an evergreen shrub or small tree up to 20 feet high; the youngest leaf-shoots are pink. Leaves four to six inches long by one to one and a half broad, bright green and glossy above, paler beneath; nerves, six to ten pairs, with small glands at the axils, which are white, and perforated on the upper surface. Flowers large, white, one to one and a half inches across the corolla lobes. Berry half-an-inch in diameter, globose. Seeds hemispheric, with a narrow ventral furrow.

It owes its name, "The Highland Coffee of Sierra Leone," to Dr. Daniell.

Mr. G. F. Scott-Elliot, F.L.S., the botanist to the Anglo-French Boundary Commission, in 1892, also collected specimens, which are now in the Kew Herbarium. Sir Joseph Hooker remarks that these are of a very slender shape, with lanceolate leaves only two to two and a half inches long by one-third to two-thirds of an inch broad, very different from those represented in the accompanying plate, "and these together favour the opinion entertained by Bentham, that both are forms of *C. arabica*, Linn."

Mr. Scott-Elliot's account (*Kew Bulletin*, 1893, p. 167) is as follows:—

"*Coffee stenophylla*, the narrow-leaved 'wild, 'bush,' or 'native coffee,' is sometimes found wild in the hills, and is more often cultivated than

* The other is *C. liberica*, Bull.

u 94127. 1375.—10/96. Wt. 123. A

the Liberian. It grows very freely, and yields quite as much as the Liberian, but is somewhat longer in coming into bearing. Both the natives and French traders at Freetown say that it has a superior flavour, and prefer it to the Liberian. In fact, latterly a certain amount has been exported to a French dealer, who is said to sell it at 4 frs. 50 cents. a lb. as 'best mocha.' Considering that it is worth at Freetown 6*d.* a lb., this should be a fairly profitable trade, and a trial shipment should be made by the English merchants to find out exactly what the market value in Liverpool would be. The plant appears to thrive best in the higher hills about Sierra Leone, on gneissose or granitic soil, and can be grown at from 500 to 2000 feet."

The plant, from which the accompanying plate was produced for the *Botanical Magazine*, was raised at Kew from seed sent in May 1894 by Sir William H. Quayle Jones, late Chief Justice of the West African Settlements and Deputy Governor of Sierra Leone.

The circumstances under which the seed was collected is given in the following despatch communicated to Kew by the Colonial Office:—

Deputy Governor, Sierra Leone, to Colonial Office.

Government House, Freetown, Sierra Leone,
My Lord Marquess, April 10th, 1894.

In reply to your Lordship's Despatch, No. 15, dated the 23rd January last, transmitting a copy of a letter from the Director of the Royal Gardens, Kew, asking that a few pounds of fresh and authentic seed of *Coffea stenophylla* may be obtained and transmitted to him for distribution to the botanic stations in the West Indies, which request your Lordship desired should be complied with if possible, I have the honour to report that on the arrival of Mr. Crowther, the curator of the Gold Coast, in the Colony, I inquired what was being done in the matter, and on learning that it was said to be too late to obtain seed, and as authentic seed was required, and we have no expert in the Colony, I asked Mr. Crowther to be so good as to endeavour to obtain some seed, and if it was not possible to do this now, to be good enough to ear-mark some of the coffee plants of the authentic kind, so as to enable us to supply authentic seed when obtainable.

I am glad to say that Mr. Crowther was able to obtain some of the seed required (nine pounds), which he certifies as true seed, having seen it growing before it was gathered, and also gave instructions for its being packed.

The coffee is being addressed to the Director, Royal Gardens, Kew, and will, if possible, be despatched by s.s. "Sherbro," which takes this despatch.

I have, &c.

The Most Honourable (Signed) W. H. Quayle Jones,
The Marquess of Ripon, K.G., Deputy Governor.
&c. &c.

Plants raised from the seed, above-mentioned, flowered at Kew as early as September 1895, in one of the tropical houses. Supplies of seed and plants of this coffee have now been distributed to the Botanic Institutions in India and the colonies from whence, if the plant resists the coffee disease and proves to be as excellent a coffee as the French merchants declare it to be, good results may be expected.

The results of the introduction to the West Indies are so far of a promising character. The plants have not, however, thriven so well as could be wished at Dominica and Ceylon. In the *Report* of the Botanic Station

[illegible] & Sons Ltd Lith

at Dominica for 1895 it is stated :—"A few plants of *Coffea stenophylla* were planted at the station, and twenty plants distributed in couples to various planters who expressed a desire to try them. Some are reported as thriving well; others are not so satisfactory. The plants put out at the station are by no means a success as yet, one only being in a really healthy state."

From Trinidad the prospects are more encouraging. In Mr. Hart's *Annual Report* for 1895 we find :—"From seed of this new coffee, sent from Kew, a number of plants have been raised. Some of the larger plants have been planted in permanent positions, and are now over three feet in height, and it is expected will flower in a few weeks for the first time."

At the Castleton Gardens, Jamaica, Mr. Fawcett is able to report:—"Fifteen plants of *Coffea stenophylla* raised from seeds from Kew, have been planted in different places about the garden and are doing well."

From the *Report* of the Director of the Royal Botanic Gardens, Ceylon, for the year 1895, we learn—

"A small plantation of 36 plants of Sierra Leone or 'upland coffee' (*Coffea stenophylla*) received from Kew in 1894 was made in April, and plants of *Lonchocarpus* sp. (the one used in Trinidad as a shade-tree for Cacao) planted among them for shade. The growth of the coffee plants has been very irregular, varying from a few inches to 3 feet, and cannot be said to be very promising. They have the appearance of plants out of their element, and look as if the climate here did not suit them. On the other hand, the *Lonchocarpus* is certainly at home, having grown very rapidly with a branching habit, and it promises to be a very useful shade-tree at low elevations. Some of the shoots have grown 8 feet in nine months."

The Director of the Botanic Gardens and Forest Department, Straits Settlements, refers to the African coffee in his *Report* for the year 1895, as follows:—

"Among these [economic plants] is a small lot of the new coffee (*Coffea stenophylla*), a plant spoken very highly of. It is growing steadily and well, and at present does not appear to be affected at all by disease. Plants have been distributed to coffee planters in different parts of the Peninsula for experiment and observation."

Explanation of Plate.

Fig. 1, portion of leaf, showing upper surface and glands; 2, ovary, style, and stigmas; 3, portion of corolla with stamens, laid open; 4, vertical section of ovary, exposing ovules; 5, berry (from the Kew Museum); 6, seeds; 7, transverse section of seed; 8, vertical section of seed; 9, embryo. All but No. 5 enlarged.

DXXXIII.—EXPLORATION OF THE KARONGA MOUNTAINS.

An exploration of the Karonga Mountains in North Nyasa within the territory of the British Central Africa Protectorate has lately been undertaken by Mr. Alexander Whyte, the chief of the scientific staff under Sir H. H. Johnston. An account of the botanical work previously done by Mr. Whyte in Nyasaland was given in the *Kew Bulletin*, 1895 (pp. 186–191). The following preliminary report of the results obtained on the Karonga range is contained in a letter from Mr. Whyte,

dated Karonga, the 16th July last, which appears in the *British Central Africa Gazette*, of August 15th :—

I have just returned from my sojourn of eighteen days on the highest range of the Deep Bay-Karonga mountains, and am pleased with the collections made. We all suffered from the cold, and had some bad cases of sickness; but, on the whole, the boys worked well, and I have got together a larger collection than ever I have made on any previous expedition.

The flora of this range proved most interesting, resembling that of Mlanje, yet differing from it, in many respects. I failed to find any trace of a conifer, but, on the other hand, the range is richer in heaths than Mlanje is. I fancy the three principal peaks of the range, to the tops of which I went, rise to an altitude of from 7000 to 8000 feet above sea level; and I thoroughly explored this portion of the range from end to end, and I could see close at hand the mountain I explored at the Mount Waller part of the range. I cannot quote figures exactly till I go thoroughly through my collections; but, of plants, I have over 6000 dried specimens; of skins of kinds, 330; of mammals, 200; of reptiles, &c., in spirits, 120; of crustaceæ, &c., 250; land shells, 5000; insects, 3000, and a collection of geological specimens.

I was much troubled with fever sores breaking out on me while on these high plateaux—if plateaux they can be called; but, luckily, I was able to keep my feet pretty free of them, so was able to get through the walking necessary to explore the place well. I do not think this range of mountains will turn out so healthy as Zomba or Mlanje. There is a want of the soft balmy bracing breezes prevailing at Mlanje. The ordinary wind is a cutting south-easter from the lake, and which we found chilly and anything but bracing. Of course there are sheltered valleys which are pleasant enough, except when the wind is driving over the mountain tops.

I should have stayed a few days longer, but some suspicious natives made their appearance on the plateau, and, in one night, built a long boma, not two miles from my camp, No. 2. Hitherto I had not seen a *trace of man* on the mountains, but saw smoke away down in the valley to the west. About two days from the plateau these unwelcome visitors, whom, I have no doubt, were a party of the Mlozi following, kept on our track when we left, and we had a bit of a scare the first night after leaving, the grass having been set fire to above our camping ground. I was very pleased to get away without a collision with these men. Had they had the pluck to attack us, our carriers would have bolted to a man, and my fine collections been lost, to say nothing of my own fate. The next day we made a forced march and got down on to the plains, reaching Karonga on the third day without further trouble.

Dr. Cross and I propose starting for a tour to-morrow round to the Tanganyika plateau, and returning through the Wankonde country. I do not anticipate great results in collections on this trip, but I shall, no doubt, get something certainly. The steamer is due for me on the 12th August, so I shall do the trip as quickly as possible.

DXXXIV.—NEW ORCHIDS.—DECADES 17–20.

161. **Liparis pauciflora**, *Rolfe*; pseudobulbis ovoideis parvis, foliis binis membranaceis breviter petiolatis late ellipticis obtusis, scapis paucifloris, bracteis late ovato-triangularibus subacutis, sepalis lanceolato-linearibus obtusis lateralibus falcatis, petalis subfiliformibus, labello obovato truncato ecalloso, columnæ alis parvis quadratis.

HAB.—Szechuen: S. Wushan, *A. Henry*, 5675, 5675*a*.

Folia 3–4 poll. longa, $1\frac{1}{4}$–$2\frac{1}{2}$ poll. lata. *Scapi* 7–10 poll. longi. *Bracteæ* $\frac{3}{4}$–1 lin. longæ. *Sepala* et *petala* 3–4 lin. longa. *Labellum* 3 lin. longum. *Columna* $1\frac{1}{2}$ lin. longa.

Allied to the Indian *L. rostrata*, Rchb. f., but the flowers are smaller and less numerous.

162. **Liparis Henryi**, *Rolfe*; caulibus brevibus, foliis membranaceis breviter petiolatis ovato-oblongis breviter acuminatis, scapis circa 15–floris, bracteis ovatis acutis recurvis, sepalis lineari-oblongis obtusis lateralibus subfalcatis, petalis elongato-linearibus subobtusis, labello obovato obtusissimo denticulato basi bituberculato, columna clavata.

HAB.—Formosa: South Cape, *A. Henry*, 2074.

Folia 3 poll. longa, 1–$1\frac{1}{4}$ poll. lata. *Scapi* 6–7 poll. longi. *Bracteæ* 1 lin. longæ. *Pedicelli* 6–7 lin. longi. *Sepala* 5–6 lin. longa, 1–$1\frac{1}{4}$ lin. lata. *Petala* 5 lin. longa. *Labellum* 4 lin. longum, 3 lin. latum. *Columna* 2 lin. longa.

Allied to *L. acuminata*, Hook. f. from the Khasia Hills. Flowers considerably smaller than in *L. macrantha*, Rolfe, purple, with the front and margin of the lip much paler.

163. **Dendrobium (§ Onychium) hainanense**, *Rolfe*; pseudobulbis gracilibus flexuosis, foliis teretibus subobtusis gracilibus recurvis, floribus axillaribus solitariis pedicellatis, sepalo postico lineari-oblongo acuto lateralibus triangulari-ovatis acutis basi ad pedem decurrentibus mentum curvatum formantibus, petala oblanceolato-linearia acuta, labello unguiculato limbo obovato-oblongo obtuso undulato, disco læviusculo, columna brevissima.

HAB.—Hainan: Lingmen, *A. Henry*; *Ford*, 272.

Pseudobulbi 1–$1\frac{1}{2}$ ped. longi. *Folia* 2–$2\frac{1}{2}$ poll. longa. *Flores* 8–9 lin. longi. *Sepalum* posticum $2\frac{1}{2}$ lin. longum; lateralia 6–7 lin. longa. *Petala* $2\frac{1}{2}$ lin. longa. *Labellum* 6 lin. longum. *Mentum* 5 lin. longum.

Allied to the Philippine *D. aciculare*, Lindl., but the internodes are shorter, the leaves stouter and more curved, and the petals and lip narrower. The flowers are white with a deep yellow spot on the disc of the lip.

164. **Cirrhopetalum Fordii**, *Rolfe*; rhizomate repente valido, pseudobulbis anguste conicis, foliis petiolatis lineari-oblongis obtusis basi attenuatis, scapis suberectis 6–8-floris, bracteis oblongo-lanceolatis acutis, sepalo postico ovato-oblongo obtuso integro lateralibus lineari-oblongis apice connatis, petalis lineari-oblongis acutis trinerviis, labello recurvo basi cordato apice lineari subobtuso, columna brevi alata apice bidentata dentibus gracilibus acutis.

HAB.—Kwangtung, *Ford*, 359.

Pseudobulbi distantes inter se 1–$3\frac{1}{2}$ poll., 1 poll. longi. *Folia* $2\frac{1}{2}$–$4\frac{1}{2}$ poll. longa, $\frac{3}{4}$–$1\frac{1}{4}$ poll. lata; petioli 6–10 lin. longi. *Scapi* 4–$4\frac{1}{2}$ poll.

longi. *Bracteæ* 2 lin. longæ. *Pedicelli* 3–4 lin. longi. *Sepalum* posticum $3\frac{1}{2}$ lin. longum; lateralia 6–7 lin. longa. *Petala* 2 lin. longa. *Labellum* 2 lin. longum.

This species much resembles *C. gamosepalum*, Griff., but the dorsal sepal and petals are not strongly ciliate, as in that.

165. **Eria cæspitosa,** *Rolfe;* cæspitosa, pseudobulbis nullis, foliis lineari-lanceolatis minute et inæqualiter bidentatis basi attenuatis carnosis, floribus axillaribus breviter pedunculatis, sepalo postico elliptico-oblongo obtuso lateralibus similibus basi in mentum brevem saccatum extensis, petalis lanceolato-oblongis obtusis, labello trilobo lobis lateralibus semiellipticis obtusis intermedio late cordato-ovato obtuso carnoso, disco bicarinato carinis basi villosis, columna brevissima.

HAB.—Hainan. Living plant received from the Hongkong botanic garden.

Planta circa 2–$2\frac{1}{2}$ poll. alta. *Folia* $1\frac{3}{4}$–$2\frac{1}{4}$ poll. longa, 2–3 lin. lata. *Pedunculi* 5–6 lin. longi. *Sepalum* posticum 2 lin. longum, $1\frac{1}{2}$ lin. latum. *Petala* $1\frac{3}{4}$ lin. longa, $\frac{3}{4}$ lin. lata. *Labellum* $2\frac{1}{2}$ lin. longum, $1\frac{3}{4}$ lin. latum. *Mentum* 1 lin. longum.

An anomalous little species, approaching the section *Bulbodium*, but peculiar in its tufted habit and the absence of pseudobulbs. Sepals and petals white with some maroon-purple stripes at the base; front lobe of lip yellow, angles of side lobes purple. It flowered at Kew in August 1894.

166. **Eria (§ Dendrolirion) formosana,** *Rolfe*; rhizomate scandente crasso, pseudobulbis oblongis 2–3-phyllis, foliis lanceolatis subacutis, racemis arcuatis multifloris rachi ferrugineo-villosa, bracteis ovato-oblongis subacutis, pedicellis ferrugineo-villosis, sepalis lanceolato-oblongis subobtusis ferrugineo-villosis, petalis sepalis paullo angustioribus, labello integro cordato-ovato subacuto subrecurvo, columna brevissima.

HAB.—Formosa: South Cape, *A. Henry*, 1978.

Pseudobulbi 1–$1\frac{1}{4}$ poll. longi. *Folia* $2\frac{1}{2}$–$4\frac{1}{2}$ poll. longa; 4–7 lin. lata. *Racemi* 3–$3\frac{1}{2}$ poll. longi. *Bracteæ* 2–3 lin. longæ. *Pedicelli* 6 lin. longi. *Sepala* et *petala* 3 lin. longa. *Labellum* 1 lin. longum. *Columna* 1 lin. longa.

167. **Nephelaphyllum chinense,** *Rolfe*; rhizomate repente valido, pseudobulbis cylindraceis, foliis breviter petiolatis ovatis acutis v. breviter acuminatis, scapis erectis 6–8-floris, bracteis ovato-lanceolatis acuminatis, sepalis petalisque lanceolatis acutis, labello suborbiculari obtusissimo obscure crenulato subtrilobo lobis lateralibus parvis apice rotundato-obtusis, disco lævi, calcare oblongo obtuso, columna clavata.

HAB.—Kwangtung: in rupibus ad Tingushan, West River, Canton, *Hance*, 17,733.

Pseudobulbi 1–$1\frac{1}{2}$ poll. longi. *Folia* $3\frac{1}{2}$–$5\frac{1}{2}$ poll. longa, $1\frac{1}{2}$–$2\frac{1}{2}$ poll. lata; petioli 4–5 lin. longi. *Scapi* 5–6 poll. longi. *Bracteæ* 4–7 lin. longæ. *Pedicelli* 3–5 lin. longi. *Sepala* et *petala* 6 lin. longa. *Labellum* 5 lin. longum. *Calcar* 3 lin. longum. *Columna* 3 lin. longa.

Described from a specimen in the British Museum.

168. **Nephelaphyllum cristatum,** *Rolfe*; caule repente radicante vaginis membranaceis laxis tectis, foliis alternis petiolatis cordato-

ovatis subobtusis, scapis laxifloris, bracteis lanceolatis acuminatis, sepalis lineari-lanceolatis apiculatis, petalis sepalis paullo latioribus, labello oblongo obscure trilobo basi saccato-calcarato lobo intermedio semiorbiculari obscure crenulato retuso, disco pubescente prope apicem insigniter fimbriato-cristato, columna clavata, clinandrio late marginato.

HAB.—Hongkong, *Ford*, 48, 254.

Folia 1–2 poll. longa, 7–13 lin. lata; petioli 6–9 lin. longi. *Scapi* 5–10 poll. longi. *Bracteæ* 2–5 lin. longæ. *Sepala* et *petala* 6 lin. longa. *Labellum* 7 lin. longum. *Columna* 3 lin. longa.

Allied to *N. cordifolium*, Lindl., but the crest much more developed. Sepals and petals green streaked with dull purple near the base; lip white passing into purple and then green near the base. A plant flowered at Kew in May 1896.

169. **Tainia hongkongensis**, *Rolfe*; tuberibus ovoideo-globosis, foliis radicalibus longe petiolatis lanceolatis acuminatis, scapis erectis, racemis laxifloris, bracteis lineari-lanceolatis acuminatis, sepalis lineari-lanceolatis acuminatis, petalis sepalis simillimis, labello integro cuneato-obovato apiculato basi breviter saccato-calcarato, disco læviter tricarinato, columna clavata alata.—*Ania angustifolia*, Benth. Fl. Hongk., p. 356 (non Lindl.!).

HAB.—Hongkong, *Wilford*, 384; *Wright*, 522; *Hance; Ford.*

Tubera ¾–1 poll. longa. *Folia* 6–8 poll. longa, ¾–1½ poll. lata; petioli 3–7 poll. longi. *Scapi* 1–2 ped. longi. *Bracteæ* 3–5 lin. longæ. *Pedicelli* 5–7 lin. longi. *Sepala* et *petala* 8–9 lin. longa. *Labellum* 6 lin. longum, 3–4 lin. latum. *Columna* 4 lin. longa.

Easily distinguished from the Indian *T. angustifolia*, Benth. (Ania angustifolia, *Lindl.*), by its entire, not trilobed, lip.

170. **Cœlogyne (§ Pleione) Delavayi**, *Rolfe*; pseudobulbis depresso-globosis nudis, foliis . . . , pedunculis infra medium vaginis membranaceis truncatis obtectis unifloris, bracteis lineari-lanceolatis obtusis, sepalis petalisque anguste lanceolatis subobtusis basi attenuatis, labello late rhomboideo obscure trilobo lobo intermedio fimbriato, disco trilamellato lamellis elevatis irregulariter crenato-dentatis, columna gracili.

HAB.—Yunnan, *Delavay*.

Pseudobulbi 6–10 lin. longi. *Pedunculi* 3–3½ poll. longi. *Bracteæ* 1–1¼ poll. longæ. *Sepala* et *petala* 1½–1¾ poll. longa, 3–4 lin. lata. *Labellum* 1½ poll. longum, 1 poll. latum. *Columna* 1¼ poll. longa.

Allied to *C. bulbocodioides*, Franch., but the flowers larger with broader sepals and petals, and the lamellæ of the lip distinctly toothed.

171. **Cœlogyne (§ Pleione) Henryi**, *Rolfe*; pseudobulbis ovoideis apice attenuatis monophyllis, foliis elliptico-lanceolatis breviter acuminatis apice subobtusis, pedunculis basi vaginis membranaceis obtectis 1–2-floris, bracteis lineari-lanceolatis acutis, sepalis petalisque anguste lanceolatis acutis, labello obscure trilobo lobis lateralibus rotundatis intermedio suborbiculari-oblongo emarginato fimbriato, disco trilamellato lamellis undulatis apice dentatis, columna gracili.

HAB.—Hupeh; South Patung, *A. Henry*, 6068, 6068*a*; Szechuen, *A. Henry*, 8826.

Pseudobulbi 7–8 lin. longi. *Folia* 4–7½ poll. longa, 1–1½ poll. lata. *Pedunculi* 3–6 poll. longi. *Bracteæ* 1–1¼ poll. longæ. *Sepala* et *petala* 1½ poll. longa. *Labellum* 1½ poll. longum, 1¼ poll. latum. *Columna* 1¼ poll. longa.

Larger than the other Chinese Pleiones, and the flowers do not appear in advance of the leaves.

172. **Cœlogyne (§ Pleione) pogonioides,** *Rolfe;* pseudobulbis parvis ovoideis apice attenuatis monophyllis, foliis elliptico-lanceolatis subobtusis, pedunculis basi vaginis membranaceis truncatis obtectis unifloris, bracteis oblongo-lanceolatis subobtusis, sepalis petalisque lanceolatis acutis basi subattenuatis, labello late rhomboideo obscure trilobo lobis lateralibus rotundatis intermedio emarginato fimbriato, disco trilamellato lamellis elevatis irregulariter crenatis, columna gracili. — *Pogonia* (§ *Eupogonia*) *sp.*, Hance in Journ. Bot., 1885, p. 247.

Hab.—Anwhei: wet rocks near Wuhu, at 3000 feet alt., *Bullock* (*Hb. Hance*, 22038); Hupeh: Patung, on high mountains, *A. Henry*, 1473, 3785.

Pseudobulbi 6 lin. longi. *Folia* 1–2½ poll. longa. *Pedunculi* 1–2 poll. longi. *Bracteæ* ½–¾ poll. longæ. *Sepala* et *petala* 1¼–1½ poll. longa, 3 lin. lata. *Labellum* 1–1¼ poll. longum. *Columna* 1–1¼ poll. longa.

Allied to *C. bulbocodioides*, Franch., but the petals are as broad as the sepals, and the keels of the lip distinctly crenate. Mr. Bullock records the flowers as bright scarlet and Mr. Henry as pink, and the latter states that the bulbs are used in medicine, yielding a drug known as "*Pen-mu.*"

173. **Pholidota cantonensis,** *Rolfe;* rhizomate repente valido, basi vaginis spathaceis obtectis monophyllis (an semper?), foliis lineari-lanceolatis obtusis basi in petiolum brevem attenuatis, scapis ad apicem pseudobulbi immaturi productis basi vaginis imbricatis obtectis, racemis arcuatis circa 12–18-floris, floribus distichis parvis, bracteis ovato-oblongis involutis deciduis, pedicellis gracilibus, sepalis elliptico-oblongis subobtusis valde concavis lateralibus carinatis, petalis ovato-oblongis subacutis, labello cymbiformi obtuso v. fere truncato, disci venis vix incrassatis, columna brevi clinandrio alato.

Hab.—Kwangtung: North River, Canton, *Ford*, 139.

Pseudobulbi ¾ poll. longi. *Folia* 2 poll. longa, 3 lin. lata. *Scapi* 1½–2 poll. longi. *Bracteæ* 2½–3 lin. longæ. *Pedicelli* 1–1¼ lin. longi. *Sepala* et *petala* 1¼–1½ lin. longa. *Labellum* 1¼–1½ lin. longum.

174. **Calanthe arcuata,** *Rolfe;* foliis elongato-lanceolatis breviter acuminatis basi attenuatis, scapis elatis, racemis laxifloris, bracteis lineari-lanceolatis subacuminatis, sepalis lanceolatis acuminatis, petalis linearibus acuminatis, labello fere ad apicem columnæ adnato limbo trilobo lobis lateralibus late oblongis apice dentatis intermedio ovato-trulliformi crenulato-undulato, disco læviter tricarinato, calcare arcuato subclavato, columna crassa.

Hab.—Hupeh: Hsingshan, *A. Henry*, 6514.

Folia 8–12 poll. longa, 1–1½ poll. lata. *Scapi* 1½ ped. longi. *Bracteæ* ½–1 poll. longæ, 1–1½ lin. latæ. *Pedicelli* 8–12 lin. longi. *Sepala* 9–10 lin. longa, 2–2½ lin. lata. *Petala* 8 lin. longa, ¾ lin. lata. *Labelli*

limbus 6 lin. longus ; lobi laterales $1\frac{1}{4}$ lin. longi ; intermedius 4 lin. latus. *Calcar* 2 lin. longum. *Columna* 2 lin. longa.

Allied to the Himalayan *C. brevicornu*, Lindl., but the spur more slender and the lip different in structure. The flowers, according to Mr. Henry, are yellow and purple.

175. **Calanthe ensifolia**, *Rolfe ;* foliis ensiformibus acutis angustis erectis, scapis elatis, racemis elongatis multifloris, bracteis lineari-lanceolatis acutis, sepalis elliptico-oblongis apiculatis subobtusis, petalis elliptico-lanceolatis apiculatis subobtusis, labello columnæ adnato 4-lobo lobis lateralibus obovato-oblongis truncatis v. obtusis intermediis semi-ovatis obtusis subdivergentibus, crista plurituberculata, columna brevi et crassissima, capsulis elliptico-oblongis brevissime pedicellatis.

Hab.—Hupeh : Chienshih, *A. Henry*, 6005 ; Szechuen : Mt. Omei, at 4500 ft. alt., *Faber*, 945.

Folia $\frac{1}{2}$–$1\frac{1}{2}$ ped. longa, 4–6 lin. lata. *Scapi* 2–$3\frac{1}{2}$ ped. longi. *Racemi* 5–6 poll. longi. *Bracteæ* 5–12 lin. longæ. *Pedicelli* 2–3 lin. longi. *Sepala* et *petala* 3–$3\frac{1}{2}$ lin. longa. *Labellum* 3–$3\frac{1}{2}$ lin. longum, 4 lin. latum. *Columna* $1\frac{1}{2}$ lin. longa.

Remarkable for its long ensiform leaves. Flowers yellow, according to Mr. Henry. It much resembles *C. Davidi*, Franch., from Tibet, but the lip is quite different.

176. **Calanthe Hancockii**, *Rolfe ;* foliis longipetiolatis elliptico-lanceolatis breviter et abrupte acuminatis subobtusis leviter undulatis, scapis elatis, racemis arcuatis multifloris, bracteis ovato-lanceolatis acuminatis, sepalis oblongo-lanceolatis acutis, petalis paullo minoribus, labello trilobo lobis lateralibus obovato-oblongis obtusis intermedio obovato-oblongo acuto v. apiculato, disco tricarinato carinis undulato-crenulatis, calcare parvo conico, columna crassa.

Hab.—Yunnan : under shady blocks of rocks at 6600 ft. alt., at Mengtse, *Hancock*, 78.

Allied to *C. striata*, R. Br., but the lip much smaller. Mr. Hancock describes the flowers as yellow.

177. **Calanthe Henryi**, *Rolfe ;* foliis elliptico-v. obovato-lanceolatis breviter et abrupte acuminatis basi attenuatis, scapis elatis, racemis multifloris, bracteis lanceolatis acuminatis, sepalis lanceolatis acutis, petalis sepalis paullo minoribus, labello columnæ omnino adnato limbo trilobo lobis lateralibus divaricatis oblique obovato-oblongis obtusis intermedio oblongo apice dilatato truncato, disco graciliter tricarinato, calcare gracili recto, columna crassa.

Hab.—Hupeh : Changyang, *A. Henry*, 5253 A, 5253 D, 5958 A.

Folia 6–10 poll. longa, 2–$2\frac{1}{2}$ poll. lata. *Scapi* $1\frac{1}{3}$–2 ped. alti. *Bracteæ* 2–4 lin. longæ. *Pedicelli* 7–10 lin. longi. *Sepala* et *petala* 7–9 lin. longa, 2–3 lin. lata. *Labellum* 5–6 lin. longum. *Calcar* 6 lin. longum. *Columna* 3 lin. longa.

Allied to the Himalayan *C. plantaginea*, Lindl., but the raceme more lax, and the spur shorter. Flowers, according to Mr. Henry, white with a little yellow.

178. **Calanthe lamellosa**, *Rolfe ;* foliis elliptico-v. obovato-lanceolatis breviter acuminatis v. acutis basi attenuatis, scapis elatis, racemis laxifloris, bracteis lanceolatis acuminatis, sepalis lanceolatis acuminatis,

petalis sepalis paullo minoribus, labello columnæ adnato limbo trilobo lobis lateralibus rotundato-oblongis obtusis intermedio suborbiculari obtuso, disco trilamellato lamellis valde elevatis, calcare conico brevissimo, columna crassa.

HAB.—Hupeh: Chienshih, *A. Henry*, 5958.

Folia 9–12 poll. longa, 2–3 poll. lata. *Scapi* $1\frac{1}{2}$ ped. alti. *Bracteæ* 3–5 lin. longæ. *Pedicelli* 9–14 lin. longi. *Sepala* et *petala* 9–10 lin. longa, $2\frac{1}{2}$ lin. lata. *Labellum* 6 lin. longum. *Columna* $2\frac{1}{2}$ lin. longa.

Allied to the Himalayan *C. brevicornu*, Lindl., but readily distinguished by its narrower, more elevated membranaceous lamellæ. Flowers, according to Mr. Henry, white with a little red and yellow.

179. **Eulophia Faberi**, *Rolfe*; rhizomate repente, tuberibus ovoideo-globosis, foliis . . . , scapis elatis basi vaginis spathaceis obtectis, bracteis ovato-lanceolatis acuminatis, sepalis oblongo-linearibus abrupte apiculatis, petalis sepalis conformibus, labello oblongo trilobo lobis lateralibus truncatis apice obscure crenulatis intermedio late rotundato crispo-undulato, disco trilamellato supra medium irregulariter fimbriato, calcare conico-cylindrico, columna clavata.

HAB.—Hupeh: Lukan gorge, Yangtse-kiang, *Faber*, 56, 946; Ichang, *A. Henry*, 494, 3589.

Scapi 1–$1\frac{1}{2}$ ped. alti. *Bracteæ* 4–7 lin. longæ. *Pedicelli* $\frac{1}{2}$–1 poll. longi. *Sepala* et *petala* 6–8 lin. longa, 2 lin. lata. *Labellum* 7–8 lin. longum. *Calcar* 3–4 lin. longum. *Columna* 4 lin. longa.

Allied to the Indian *E. campestris*, Wall, but the flowers larger and less numerous, and the spur longer.

180. **Cymbidium Faberi,** *Rolfe;* foliis elongato-linearibus acutis coriaceis venis prominentibus, scapis suberectis v. arcuatis, racemis sæpissime multifloris, bracteis lanceolatis acuminatis, sepalis lineari-lanceolatis acutis, petalis sepalis paullo minoribus, labello trilobo lobis lateralibus erectis semioblongis apice rotundatis intermedio elliptico-oblongo obtuso undulato minutissime crenulato velutino, disco infra medium bicarinato carinis arcuatis, columna clavata angulis acutis.

HAB.—Chekiang: Tientai Mt., at 2000 ft. alt., *Faber*, 94; Szechuen: S. Wushan, *A. Henry*, 5515.

Folia 2–$2\frac{1}{4}$ ped. longa, 3–6 lin. lata. *Scapi* 1–$2\frac{1}{2}$ ped. alti. *Bracteæ* 5–13 lin. longæ. *Pedicelli* $\frac{3}{4}$–$1\frac{1}{2}$ poll. longi. *Sepala* et *petala* $1\frac{1}{4}$–$1\frac{1}{2}$ poll. longa, $3\frac{1}{2}$–4 lin. lata. *Labellum* 1 poll. longum. *Columna* 8–9 lin. longa.

Allied to the Himalayan *C. cyperifolium*, Wall., but the flowers quite distinct, and the colour yellow, according to Mr. Henry.

181. **Cyrtopera formosana,** *Rolfe*; per anthesin aphylla, foliis . . . , scapis robustis, racemis multifloris, bracteis lineari-lanceolatis acuminatis, sepalis lanceolato-oblongis acutis lateralibus pedi columnæ insertis, petalis sepalis similibus minoribus, labello trilobo lobis lateralibus rotundato-oblongis obtusis intermedio triangulari-ovato apiculato, disco obtuse tricarinato carinis asperulis, calcare brevi saccato obtuso, columna clavata.

HAB.—Formosa: South Cape, *A. Henry*, 1974.

Scapi 1–1½ ped. alti. *Bracteæ* 7–9 lin. longæ. *Pedicelli* 3 lin. longi. *Sepala* 7 lin. longa. *Petala* 5 lin. longa. *Labellum* 6 lin. longum. *Columna* 3 lin. longa.

Allied to the Indian *C. bicarinata*, Lindl.

182. **Luisia Hancockii,** *Rolfe;* foliis teretibus rigidis subacutis, racemis brevissimis 2–3-floris, bracteis late triangulari-ovatis subobtusis concavis, sepalis elliptico-oblongis obtusis subconcavis, petalis elliptico-oblongis obtusis planis, labello subcordato-oblongo obtuso v. emarginato, disco leviter 5–7-carinato, columna brevissima.

HAB.—Chekiang: western hills of Ningpo, *Hancock*, 22.

Planta 3–6 poll. alta. *Folia* 2–2½ poll. longa. *Bracteæ* 1 lin. longæ. *Pedicelli* 4 lin. longi. *Sepala* 2½ lin. longa. *Petala* 2½ lin. longa. *Labellum* 2½–3 lin. longum.

Habit of *L. teres*, Blume, but flowers smaller, and lip very differently shaped. Recorded as found growing on a wax-tree (*Stillingia sebifera*) beside the river; very rare.

183. **Sarcochilus hainanensis,** *Rolfe;* caule scandente, foliis lineari-oblongis inæqualiter bidentatis, racemis axillaribus vaginis foliorum perforatis compressis multifloris, floribus sæpissime singillatim evolutis, bracteis distichis conduplicatis acute carinatis subincurvis subacutis, sepalis lineari-lanceolatis caudato-acuminatis, petalis sepalis paullo brevioribus, labello trilobo lobis lateralibus semioblongis apice rotundato-truncatis, intermedio triangulari-ovato subacuto carnoso, disco callo rotundato truncato instructo, sacco rotundato-oblongo, columna brevissima.

HAB.—Hainan. Living plant received from the Hongkong botanic garden.

Folia 3½–4 poll. longa, ¾–1 poll. lata. *Racemi* 2–3 poll. longi. *Bracteæ* 2½–3 lin. longæ. *Pedicelli* 6 lin. longi. *Sepala* et *petala* 1½–1¾ poll. longa. *Labellum* 6 lin. longum.

Allied to *S. Arachnites*, Rchb. f., but the front lobe of the lip distinctly triangular and the side lobes more erect. Flowers light yellow, front lobe of lip white with a few buff markings in the throat and on the side lobes.

184. **Vanda hainanensis,** *Rolfe;* foliis lineari-oblongis obtusis v. acute bidentatis, pedunculis robustis, racemis densifloris, bracteis late ovatis subobtusis, sepalis elliptico-oblongis obtusis lateralibus paullo latioribus, petalis sepalis conformibus basi subattenuatis, labello pandurato-oblongo apice breviter trilobo lobo intermedio oblongo obtuso crasse carnoso subtus infra apicem profunde carinato-lamellato, disco crasse tricarinato, calcare conico subcompresso, columna brevissima et latissima.

HAB.—Hainan, *B. C. Henry*, 37.

Folia 4–7 poll. longa, 6–8 lin. lata. *Racemi* 4–5 poll. longi. *Bracteæ* 2 lin. longæ. *Pedicelli* 9–10 lin. longi. *Sepala* 8 lin. longa, 4½–5 lin. lata. *Petala* 7 lin. longa, 3½ lin. lata. *Labellum* 6 lin. longum, 4 lin. latum. *Calcar* 2½ lin. longum.

The third species of the section *Anota*, a group hitherto only known from the Philippines and Burma. Flowers white and purple; fragrant.

185. **Thelasis hongkongensis,** *Rolfe;* pseudobulbis ovoideo-globosis, foliis lineari-oblongis obtusis, scapis gracilibus basi vaginis clausis

apice ovatis subobtusis obtectis, spicis densifloris, bracteis patentibus v. recurvis ovatis acutis, sepalis carinatis postico ovato-lanceolato subacuto lateralibus lineari-oblongis obtusis, petalis linearibus obtusis, labello lanceolato-ovato acuto tricarinato, columna brevissima, rostello ovato-lanceolato apice bicuspidato.—*Thelasis pygmæa*, Hance in Journ. Linn. Soc., xiii., p. 127 (non Lindl.).

HAB.—Hongkong, *Hance*, 1287; *Ford*, 18.

Pseudobulbi 4–6 lin. longi. *Folia* 1–2 poll. longa. *Scapi* 3–5 lin. longi. *Bracteæ* 1 lin. longæ. *Sepala* et *petala* $1-1\frac{1}{4}$ lin. longa. *Labellum* 1 lin. longum.

Allied to the Philippine *T. triptera*, Rchb. f., but the bracts much narrower and the flowers smaller.

186. **Galeola Faberi**, *Rolfe;* caulibus altis, vaginis ovatis subobtusis carnosis, paniculis amplis laxis multifloris ferrugineo-tomentosis, bracteis ovato oblongis acutis, sepalis petalisque oblongo-linearibus subobtusis, labello integro elliptico obtuso crispulo-crenulato lateribus inflexis, venis elevatis papilloso-crenulatis.

HAB.—Szechuen: Mt. Omei, at 7000 ft. alt., *Faber*.

Vaginæ $\frac{3}{4}$–1 poll. longæ. *Bracteæ* $1\frac{1}{2}$–2 lin. longæ. *Pedicelli* $1\frac{1}{2}$ poll. longi. *Sepala* et *petala* 1 lin. longa. *Labellum* 11 lin. longum. *Columna* 5 lin. longa.

Allied to the Himalayan *G. lindleyana*, Rchb. f., but with much narrower segments.

187. **Listera grandiflora**, *Rolfe;* caulibus gracilibus, foliis late cordatis v. ovato cordatis subacutis v. apiculatis, racemis pubescentibus paucifloris, bracteis ovatis acutis, sepalis ovato-oblongis subobtusis concavis, petalis linearibus, labello magno late obcordato nervo medio incrassato, columna arcuata.

HAB.—Hupeh: Fang, *A. Henry*, 6876; Szechuen: Mt. Omei, in dark damp place at 8000–9000 ft. alt., *Faber*, 948.

Planta 9–10 poll. alta. *Folia* $1\frac{1}{4}$ poll. longa, $1\frac{1}{4}$–$1\frac{1}{2}$ poll. lata. *Racemi* $2\frac{1}{2}$–3 poll. longi. *Bracteæ* 2–$2\frac{1}{2}$ lin. longæ. *Sepala* 3 lin. longa. *Petala* $2\frac{1}{2}$ lin. longa. *Labellum* 6 lin. longum, 6 lin. latum. *Columna* 3 lin. longa.

The largest-flowered species in the genus.

188. **Spiranthes exigua**, *Rolfe;* parva aphylla glabra, scapis erectis vaginis laxis subimbricatis obtectis, bracteis oblongo-lanceolatis subacutis, sepalis ovatis subobtusis lateralibus obliquis, petalis oblongis subobtusis sepalis angustioribus, labello basi erecto deinde subito patente integro hastato-oblongo subacuto basi bituberculato, columna brevi incrassata, rostello subulato recurvo.

HAB.—Hupeh, *A. Henry*, 6585.

Herba $2\frac{1}{2}$ poll. alta. *Scapi* 2 poll. longi. *Bracteæ* $2\frac{1}{2}$–3 lin. longæ. *Pedicelli* 2 lin. longi. *Sepala* et *petala* $1\frac{3}{4}$ lin. longa. *Labellum* $1\frac{3}{4}$ lin. longum.

A very curious little leafless plant. The minute hastate lobes of the lip are easily overlooked, and the rostellum is curiously recurved at the apex.

189. **Physurus chinensis**, *Rolfe;* caulibus brevibus, foliis subcæspitosis petiolatis ovato-oblongis subacutis membranaceis viridibus, scapis

pubescentibus vaginis paucis obtectis, spicis elongatis multifloris, bracteis lanceolatis acuminatis pubescentibus, sepalo postico erecto elliptico-oblongo subobtuso lateralibus patentibus subobliquis elliptico-oblongis subobtusis, petalis sepalo postico subsimilibus, labello subtrilobo lobis lateralibus erectis parvis intermedio reflexo late ovato subapiculato, calcare conico bidentato, columna brevissima.

HAB.—Kwangtung: Lienchow river, *Ford*, 134, 240. Also cultivated at Kew.

Folia $1\frac{1}{4}$–4 poll. longa, $\frac{1}{2}$–$1\frac{3}{4}$ poll. lata, petioli $\frac{1}{2}$–1 poll. longi. *Scapi* $\frac{3}{4}$–$1\frac{3}{4}$ poll. longi. *Bracteæ* 3–5 lin. longæ. *Sepala* et *petala* 2 lin. longa. *Labellum* 2 lin. longum. *Calcar* $1\frac{1}{2}$ lin. longum.

The genus has not hitherto been recorded from China.

190. **Cheirostylis yunnanensis**, *Rolfe*; foliis breviter petiolatis ovatis subacutis petiolis basi laxe vaginatis, scapis pubescentibus vaginis 2–4 spathaceis acuminatis obtectis apice 2–5-floris, bracteis ovatis acuminatis concavis, sepalorum tubo oblongo lobis triangulari-ovatis subobtusis, petalis anguste obovato-oblongis apice breviter et obtuse 2–3-dentatis, labello unguiculato flabellato profunde bilobo lobis irregulariter 5–7-dentatis, columna brevi rostelli lobis falcato-linearibus.

HAB.—Yunnan: shady rocky places at Mengtse, *Hancock*, 25. "Very rare"

Folia $\frac{1}{2}$–1 poll. longa, 4–7 lin. lata; petioli 3–4 lin. longi. *Scapi* 3–7 poll. longi. *Bracteæ* 3–$3\frac{1}{2}$ lin. longæ. *Sepalorum* tubus $1\frac{3}{4}$ lin. longus, lobi $1\frac{1}{4}$ lin. longi. *Petala* $3\frac{1}{2}$–4 lin. longa, apice 2 lin. lata. *Labelli* unguis 2 lin. longus; limbus 4–$4\frac{1}{2}$ lin. latus. *Columna* $1\frac{1}{4}$ lin. longa; brachia 1 lin. longa; rostelli lobi $\frac{3}{4}$ lin. longi.

Allied to the Indian *C. flabellata*, Wight, but the flowers are much larger, and the petals much longer than the sepals.

191. **Goodyera Henryi**, *Rolfe*; caulibus repentibus elongatis, foliis ovatis subacutis v. apiculatis 5–7-nervis petiolatis basi in vaginam tubulosam amplexicaulem dilatatis, spicis brevibus multifloris, bracteis lanceolatis v. ovato-lanceolatis acutis, sepalis ovato-oblongis obtusis concavis trinervis, petalis oblongo-lanceolatis subacutis uninerviis, labello ovato obtuso basi concavo-saccato intus fimbriato-villoso, columna brevi, anthera lanceolata, rostello in lobos elongatos diviso.

HAB.—Hupeh: Ichang, *A. Henry*, 6878.

Caules $\frac{1}{2}$–1 ped. longi. *Folia* $\frac{3}{4}$–$1\frac{1}{4}$ poll. longa, 6–10 lin. lata; petioli 5–6 lin. longi. *Spicæ* 1–$1\frac{1}{4}$ poll. longæ. *Bracteæ* 4–5 lin. longæ. *Sepala* $4\frac{1}{2}$ lin. longa. *Petala* 4 lin. longa. *Labellum* $3\frac{1}{2}$ lin. longum.

Allied to the Indian *G. foliosa*, Lindl.

192. **Habenaria Faberi**, *Rolfe*; parvula, monophylla, tubere globoso, folio sessili lanceolato acuminato, scapis uni- v. bifloris, bracteis ovato-lanceolatis subacutis, sepalis elliptico-oblongis obtusis, labello 4-lobo, lobis oblongis obtusis subæqualibus, calcar clavato, columna brevissima.

HAB.—Szechuen: Mt. Omei on rocks at 9000 ft. alt., *Faber*, 319.

Herba circa 2–3 poll. alta. *Folium* 13 lin. longum, 18 lin. latum. *Bracteæ* 1–$1\frac{1}{2}$ lin. longæ. *Sepala* et *petala* 1 lin. longa. *Labellum* 2 lin. longum.

Allied to *H. Pinguicula*, Benth., but the flowers only about a quarter as large.

193. **Habenaria Fordii**, *Rolfe;* foliis radicalibus suberectis oblongo-lanceolatis acutis, scapis elatis, racemis multifloris, bracteis ovato-lanceolatis, acutis, sepalo postico cum petalis in galeam connivente lateralibus patentibus oblique semiovatis acutis, petalis lanceolato-linearibus acutis, labello angusto trifido lobis lineari-filiformibus, calcare elongato apice crassiusculo, columna brevi, processubus stigmaticis porrectis, canalibus antheræ elongatis.

HAB.—Kwangtung, *Ford*, 360.

Folia 9–10 poll. longa, 1½–2¼ poll. lata. *Scapi* 2 ped. alti. *Racemi* 3–5 poll. longi. *Bracteæ* ¾–1½ poll. longæ. *Sepalum posticum* 6 lin. longum; lateralia 6½ lin. longa, 3½ lin. lata. *Petala* 6 lin. longa. *Labellum* 1 poll. longum. *Calcar* 2½–3¼ poll. longum.

Allied to the Indian *H. commelinifolia*, Wall., but the flowers much larger and the leaves not cauline. "Flowers white."

194. **Habenaria Hancockii**, *Rolfe;* foliis caulinis oblongo-lanceolatis acutis, scapis squamis lanceolatis longe acuminatis vestitis, racemis brevibus v. subcapitatis multifloris, bracteis lanceolatis acuminatis, sepalo postico elliptico-ovato obtuso lateralibus falcato-semiovatis subobtusis subcarinatis patentibus v. reflexis, petalis subfalcato-oblongis obtusis subcarinatis, labello profunde tripartito lobis linearibus subacutis lateralibus subpatentibus, calcare filiformi apice clavato, columna brevi, processubus stigmaticis oblongis carnosis, canalibus antheræ elongatis, staminodiis oblongis latis, rostello triangulari tridenticulato.

HAB.—Yunnan: Damp grassy slopes at Mengtse, at 5500–6000 ft. alt., *Hancock*, 85.

Planta 1–1½ ped. alta. *Folia* 1¼–3 poll. longa, 3–6 lin. lata. *Racemi* 1½–2 poll. longi. *Bracteæ* 6–9 lin. longæ. *Sepalum* posticum 2½–3, lin. longum; lateralia 3½ lin. longa, 2 lin. lata. *Petala* 2½–3 lin. longia, 1 lin. lata. *Labelli* lobi laterales 4 lin. longi; intermedius 5½–6 lin. longus. *Calcar* 7–9 lin. longum. *Columna* 2 lin. longa.

Allied to the Indian *H. acuifera*, Wall., but with much longer side lobes to the lip, and a more clavate spur. "Flowers flesh-colour."

195. **Habenaria Henryi**, *Rolfe;* foliis caulinis oblongis v. elliptico-oblongis acutis v. subobtusis, racemis laxifloris, bracteis lanceolatis acutis v. acuminatis, sepalo postico erecto ovato subobtuso concavo lateralibus patentibus oblongis obtusis, petalis oblique ovato-lanceolatis acutis cum sepalum posticum conniventibus galeam formantibus, labello integro carnoso oblongo-lineari obtuso, calcare gracili sæpissime curvato.

HAB.—Shingking: Changpeishan, *James;* Kiangsi: Kiukiang, *Shearer;* Hupeh: Patung, *A. Henry*, 4716, 6148; Kuei, *A. Henry*, 7663; Szechuen: Wushan, *A. Henry*, 7453; Mt. Omei, *Faber*, 941.

Planta 1–1¾ ped. alta. *Folia* 1½–4½ poll. longa, ½–1½ poll. lata. *Racemi* 4–9 poll. longi. *Pedicelli* 4–5 lin. longi. *Sepalum* posticum 2½ lin. longum; lateralia 3 lin. longa. *Petala* 2 lin. longa. *Labellum* 3–4 lin. longum. *Calcar* 5–8 lin. longum. *Columna* 1½ lin. longa.

Allied to *H. Keiskei*, Miq., but taller, and with laxer racemes of smaller flowers.

196. **Habenaria humidicola**, *Rolfe;* foliis radicalibus ternis lanceolato-oblongis subacutis, racemis brevibus laxifloris, bracteis ovato-lanceolatis acuminatis, sepalis ovato-oblongis obtusis, lateralibus deflexis, petalis lineari-oblongis obtusis, labello tripartito lobis lineari-filifor-

mibus, calcare elongato filiformi, columna brevi, anthera brevi canalibus et processubus stigmaticis brevibus.

Hab.—Chekiang: Ningpo Mts., in damp places in the shade of rocks, *Faber*, 200.

Planta 6–7 poll. alta. *Folia* $1\frac{1}{2}$–2 poll. longa, 5–7 lin. lata. *Racemi* 2 poll. longi. *Bracteæ* 2–3 lin. longæ. *Sepala* et *petala* $1\frac{1}{2}$ lin. longa. *Labellum* 2 lin. longum. *Calcar* 4 lin. longum.

Allied to *H. reniformis*, Hook f., but the leaves longer, and the flowers smaller and more slender.

197. **Habenaria omeiensis**, *Rolfe;* foliis caulinis oblongo-lanceolatis v. oblongis breviter acuminatis, racemis laxis, bracteis lanceolatis acuminatis, sepalo postico ovato subacuto concavo lateralibus oblongis obtusis, petalis lineari-oblongis obtusis, labello integro lineari acuminato incurvo, calcare elongato flexuoso, columna brevi, antheræ canalibus contiguis oblongis, processubus stigmaticis subglobosis.

Hab.—Szechuen: Mt. Omei, at 8000 ft. alt., *Faber*, 951.

Planta $1\frac{3}{4}$ ped. alta. *Folia* 2–6 poll. longa, $\frac{1}{2}$–$2\frac{1}{2}$ poll. lata. *Racemi* 4 lin. longi. *Bracteæ* $\frac{1}{2}$–$1\frac{1}{2}$ poll. longæ. *Sepala* 3–4 lin. longa. *Petala* $2\frac{1}{2}$–3 lin. longa. *Labellum* 7 lin. longum. *Calcar* 1–$1\frac{1}{4}$ lin. longum. *Columna* 2 lin. longa.

Allied to the Indian *H. latilabris*, Hook. f., and *H. stenantha*, Hook. f., but having a more lax raceme of larger flowers.

198. **Diplomeris chinensis**, *Rolfe;* tubere ovoideo-globoso, caule abbreviato monophyllo, folio lanceolato acuto basi attenuato, scapis gracilibus glabris unifloris, bractea oblongo-lanceolata subacuta concava, sepalo postico ovato-oblongo obtuso lateralibus obliquis late semiovatis obtusis, petalis obliquis latissime semiovatis brevibus apice rotundato-obtusis, labello obovato-orbiculari trilobo basi breviter et latissime unguiculato lobis late obovatis truncatis v. emarginatis, calcare elongato basi inflato-conico apice gracili, columna lata.

Hab.—Chekiang: Tientai Mt., on damp rocks at 1000 ft. alt., *Faber*, 95.

Tuber 5–7 lin. longum. *Folium* $\frac{1}{2}$–$2\frac{1}{2}$ poll. longum, 2–6 lin. latum. *Scapus* 2–4 poll. longus. *Bractea* 2–3 lin. longa. *Sepala* 3 lin. longa; posticum $1\frac{1}{2}$ lin. latum; lateralia 2 lin. lata. *Petala* 2 lin. longa, $2\frac{1}{4}$ lin. lata. *Labellum* 6–8 lin. longum. *Calcar* 8–11 lin. longum. *Columna* $1\frac{1}{2}$ lin. longa.

Remarkable for the inflated base of the spur.

199. **Hemipilia Henryi**, *Rchb. f. ex. Bur. et Franch. in Journ. de Bot.* 1891, *p.* 152 (*nomen tantum*); tubere oblongo, caule abbreviato monophyllo, folio sessili cordato-ovato apiculato, scapis glabris, racemis multifloris, bracteis oblongo-lanceolatis acuminatis, sepalis ovato-oblongis obtusis lateralibus subobliquis, petalis oblongis subobtusis, labello obovato subquadrilobo lobis rotundatis v. obtusissimis, calcare basi crasso apice gradatim attenuato, columna lata.

Hab.—Hupeh: Ichang, *A. Henry*, 1534; Nanto, *A. Henry*, 6347; Hsingshan, *A. Henry*, 6347 A.; Fang, *A. Henry*, 6347 B.

Tuber $\frac{3}{4}$–1 poll. longum. *Folium* $1\frac{1}{2}$–4 poll. longum, 1–$2\frac{3}{4}$ poll. latum. *Scapus* $\frac{1}{2}$–1 ped. altus. *Bracteæ* 3–5 lin. longæ. *Pedicelli* 6–9 lin. longi. *Sepala* $3\frac{1}{2}$–4 lin. longa, 2 lin lata. *Petala* $2\frac{1}{2}$–3 lin.

longa, 1 lin. lata. *Labellum* 6–7 lin. longum, 5–6 lin. latum. *Calcar* 6–9 lin. longum. *Columna* 1 lin. longa.

Differs from *H. flabellata*, Bur. et Franch., in its much larger flowers, independently of structural characters.

200. **Cypripedium ebracteatum**, *Rolfe;* herba diphylla, caule nano, foliis latissime ovato-orbicularibus subacutis, scapis minutissime puberulis unifloris, flore ebracteato, sepalo postico elliptico-ovato subacuminato, lateralibus omnino connatis ovato-lanceolatis acuminatis, petalis lanceolatis acuminatis, labello elliptico-oblongo obtuso saccato, staminodio ovato-oblongo, capsula oblonga glabra.

Hab.—Hupeh, *A. Henry*, 1404*a*.

Folia 4–4½ poll. longa, 3½–4 poll. lata. *Scapus* 6–8 poll. longus. *Sepala* 1 poll. longa; posticum ¾ poll. latum; lateralia 5 lin. lata. *Petala* 1 poll. longa, 3 lin. lata. *Labellum* ¾ poll. longum. *Staminodium* 2 lin. longum. *Capsula* 1¼ poll. longa, 5 lin. lata.

A remarkable ebracteate species, differing from *C. micranthum*, Franch., in its much larger flowers, and from *C. margaritaceum*, Franch., and *C. Fargesii*, Franch., in its saccate lip. The only specimen seen is at the British Museum, having been distributed with *C. japonicum*, Thunb.

DXXXV.—KAPOK.

Kapok is the Dutch name for the seed hairs of the white silk-cotton tree of the East Indies (*Eriodendron anfractuosum*). The kapok of Java is regarded as the best. It is, however, too short in the staple, too smooth, and too soft to be spun into yarn. Its chief use is for stuffing pillows, mattresses, and sofas, where its lightness, immunity from moth, softness, and elasticity, render it superior to all but the best qualities of feathers, wool, and hair.

Eriodendron anfractuosum is a lofty forest tree with a large straight trunk covered with prickles when young. The branches are horizontal and arranged in whorls. The rather large flowers are white, and are followed by a dry, green capsule, in shape like a short cucumber, filled with black seeds embedded in silky hairs. The seeds are sometimes eaten and yield a bland, fatty oil. The residual cake makes an excellent food for cattle. The tree occurs in the forest throughout the hotter parts of India and Ceylon and extends to Sumatra, Java, and the Philippine Islands. It is also distributed to South America, the West Indies and tropical Africa. The habit of the tree is a very striking one. This is well shown in the representations of it in the North Gallery, Nos. 129, 176, and 632. It is majestic in size, and generally towers above all other trees in the dry forests where it flourishes. It sends out large buttress-like expansions from the base, while its branches afford a favourite resting place for numerous epiphytes. In fact the upper parts of an old silk-cotton tree form a very interesting garden. The branches and forks are thickly covered with the large tufted growth of several species of *Tillandsia*, numerous ferns, aroids, orchids, and the seedlings of *Ficus* and other trees whose seeds have been carried thither by birds. Next to the Cocoa-nut palm the silk-cotton tree affords one of the most characteristic features of tropical vegetation. It is regarded

with superstition by the negroes both in Africa and the West Indies, and they can with difficulty be induced to cut it down or handle it.

In India the tree yields an almost opaque gum of a dark-red colour, which is said to be astringent, and to be employed medicinally in bowel complaints. The wood is soft and used in tanning leather. An inferior reddish fibre is sometimes prepared from the bark, which is used locally for making ropes and paper. It possesses, however, no commercial value; and the barking of the tree would not compensate for the injury done to it as a source of floss. The young roots are also used medicinally in Bombay. They are dried in the shade, powdered and mixed with the juice of the fresh bark and sugar.

In Java the growing silk-cotton trees are commonly used as telegraph posts as the branches grow so conveniently at right angles to the trunk that they do not interfere with the wires.

The kapok or floss from *Eriodendron anfractuosum* is, according to present demand, a fibre of considerable merit The modern trade in it was created by the Dutch merchants, who drew their chief supply from Java. It is said that its elasticity and harshness prevent its becoming matted as in some other flosses. The extending use of kapok seems to point to it as a fibre likely to increase in demand year by year. It is important, as pointed out by Dr. Watt, to guard against an error "made by many writers of viewing kapok as a generic trade name for all the silk-cotton—including that of the *simal*—the floss of *Bombax malabaricum*. When the demand for kapok first started, Indian exporters placed in the market a quantity of very dirty *simal*, having a large percentage of dust as well as seed. This was at once condemned and fetched a price that would not cover the transport charges. India thus fell into an inferior position, which might have been avoided if carefully cleaned fibre had been sent to Europe."

In the *Annual Report* of the Director of the Botanical Department, Jamaica, for the year 1884, p. 48, the following particulars were given respecting kapok or silk-cotton:—

The silk-cotton tree is a very familiar object in the Jamaica landscape, especially on the north side, where it attains an enormous size. The wood was formerly (and sometimes is now) utilised for the purpose of making canoes; but for all practical purposes the tree is accounted of little value in the West Indies.

The chief supply of kapok for the Dutch market is obtained from the East Indies, and during the years 1877–82 the following quantities were imported, viz.: 1877, 14,093 bales; 1878, 10,519 bales; 1879, 12,050 bales; 1880, 6479 bales; 1881, 9991 bales, and 1882, 28,032 bales. The average price paid in English money was 7*d.* per lb. nearly.

A great difficulty found in the importation of silk-cotton was due to its great bulk and the heavy cost of transport. This difficulty has now been overcome by a silk-cotton press constructed by Stork and Co. at Henglo.

It now only remains for some enterprising firm to initiate the collection of silk-cotton in Jamaica and ship it in well packed bales for the European market. If each cotton tree yielded at the rate of about 100 lbs. weight of clean floss there might be exported from Jamaica every year about 3000 bales of silk-cotton of the value of 9000*l.*

In Ceylon, according to the *Tropical Agriculturist* (1884, p. 153), kapok was collected throughout the villages in the interior, principally

in the Matura and Tangalla districts and in the Central Province. The season commences in May, and only one crop can be obtained in the year. The trees do not attain maturity until the fifth year. It is not uncommon to gather 1000 to 1500 pods from one tree. In preparing the article for export the chief difficulty was experienced in freeing it from the seeds. The improved Patent Saw Cotton Gin imported in 1884 was very satisfactory. The industry in Ceylon was started in consequence of letters written from the Melbourne Exhibition by the late Mr. A. M. Ferguson, C.M.G.

Kapok had already attracted considerable attention in Australia. Messrs. Buchanan, of Melbourne, in their *Monthly Register* dated 21st June 1886, gave the following account of it:—"It is now 15 years since the first shipment of Java kapok came to this market . . . . but so firmly did it establish itself . . . . that when supplies were not regularly forthcoming a substitute was sought for. In proof of the lasting qualities of kapok, a non-commissioned officer engaged in the Mahratta war of 1843 has a pillow-case in constant use ever since which still retains its elasticity and fulness, and who assures us he has found nothing so cool or healthful to sleep on in warm climates. It is difficult to obtain reliable statistics concerning the trade . . . We find it entered at the local Customs under all manner of names, such as 'vegetable fibre,' 'vegetable wool,' 'silk cotton,' 'tree cotton,' 'raw cotton,' and 'Simoul cotton.' There were imported into Melbourne during the year 1886 a total of 8845 bales of the value of 26,850*l*. A bale of Java kapok weighs about 80 lbs., a bale of Ceylon about 200 lbs., and a bale of India about 400 lbs."

Serious complaint is made in Australia and elsewhere of the quality of the kapok shipped from India. "Even at the low price of India kapok it is found better to pay 8½*d*. and higher per lb. for Javan than 3*d*. for Indian. The Indian is frequently received in such a filthy condition as to be almost unsaleable." It is stated that hydraulic or steam-press packing of kapok tends to destroy that peculiar elasticity to which it owes its value, "for without its springy nature it is unsuitable as a stuffing material." Moreover, by hard packing, when the seeds are left attached to the fibre, a dark coloured oil is expressed which is suffused over the kapok, "hence a noticeable difference in colour between the Indian and the beautifully white Java products."

"At Java the trade has assumed a uniform practice. No unclean stuff is shipped, but the different grades of cleaning denote standards of quality; the first, 'extra cleaned,' being cleaned by machinery, and the first picking of the crop; the second, denoted as 'best cleaned picked,' being all hand-picked and free from seeds, except an odd one here and there; the third is simply designated 'cleaned.' It contains a few seeds, together with the 'slubs,' or little knotty, curly lumps, which are cast aside from the higher grades. The quality of any one class is found most uniform throughout the bales. Packing is all done in straw mats, and never tightly pressed; the first quality, 'extra cleaned,' weighing about 65 lbs.; the second and third from 75 lbs. to 90 lbs. Bales over 90 lbs. to 95 lbs., on account of having to be dumped by machinery, destroying the elasticity of the fibre, are reckoned not to be worth within ½*d*. to 1*d*. per lb. in value of bales of lesser weight.

"In fact, it is a peculiar feature of the Java trade that weight of bales form an essential condition of price—the lighter the highest, and *vice versâ*."

The following paragraph appeared in the *British North Borneo Herald* for August 1, 1896:—

"Kapok, the down which envelops the seeds of the silk-cotton tree, is, says the *Produce World*, receiving much attention. The cultivation of the trees is even said to be ousting coffee in the province of Burmah; they grow to a height of 80 feet to 100 feet, the wood is soft and worthless; the fibre, kapok, is extensively used for stuffing mattresses, pillows, cushions, seats of railway carriages, &c. The lack of proper machinery for cleaning the fibre stood in the way of its development, but that obstacle has been removed, and the stuff as it comes to market is in excellent condition for the purposes we have named."

Kapok has not been received in this country on a very large scale. It is not, however, quite unknown here. The following particulars have been received from a well-known firm in the City:—

Messrs. IDE & CHRISTIE to ROYAL GARDENS, KEW.

72, Mark Lane, London, E.C.,
September 28, 1896.

SIR,

IN reply to your letter of the 24th instant, Kapok is coming here regularly to the extent of 100 bales a month from India and Ceylon. To-day's value is 2½*d*. to 4*d*. per lb. The trade is not large, but may grow.

Yours, &c.
(Signed) IDE & CHRISTIE.

Dr. Morris, C.M.G.,
Assistant Director, Royal Gardens,
Kew.

DXXXVI.—THE FLORA OF TIBET.

Until quite recently the Herbarium contained no plants from Central Tibet, except a small set of such portions of Przewalski and Potanin's collections as had been worked out by the late Mr. Maximowicz. In 1892, Surgeon-Captain W. G. Thorold presented the plants he collected on his journey across Tibet with Captain Bower; and in 1893 Mr. W. Woodville Rockhill presented, through Professor C. S. Sargent, a similar collection made by himself on his last journey in Tibet. Messrs. Thorold and Bower traversed the country from west to east, between the 30th and 34th parallels of latitude; and Mr. Rockhill's extreme western point was about 90° E. long., a little to the north of Tengri Nor. Some account of these collections will be found in the *Bulletin* for 1893, p. 369, and 1894, p. 136; and they formed the subject of a paper by Mr. W. Botting Hemsley, published in the *Journal of the Linnean Society*, vol. xxx., pp. 101–140. Mr. Rockhill reproduced the account of his plants in his book entitled *Diary of a Journey through Mongolia and Tibet*, pp. 380–385. Full particulars of the localities and altitudes are given; the whole forming an instructive and valuable contribution to botanical literature.

On returning early in the present year, from their arduous journey across Tibet from north to south, Mr. and Mrs. St. George R. Littledale presented Kew with a small collection of dried plants which they had succeeded in saving from the fate of being left by the roadside, a fate which befell the bulk of their collections and instruments. This collection was made in the Goring Valley, in 30° 12′ N. lat., and 90° 25′

E. long., at an elevation of about 16,500 ft. It contains sixty-eight species, including one fern and two funguses, belonging to forty-seven genera and twenty-five natural orders; proportions similar to those of typical insular floras. Ten of the species have been described as new, and, as may be gathered from the enumeration, most of the others belong to the region, or extend only to the Himalayas and the lofty mountains of Western China. A few, such as *Aconitum Napellus*, *Lychnis apetala*, *Potentilla fruticosa*, *Myriophyllum verticillatum*, *Leontopodium alpinum*, *Taraxacum palustre*, *Polygonum viviparum* and *Carex ustulata*, have a wide range. A few others extend to Siberia. Coming to the genera, there is complete evidence that the flora belongs to the cold temperate, and arctic type, which is essentially the same all round the hemisphere. Thirty-four of the genera are British, and most of the others have a wide range. The regional and local genera are: *Meconopsis*, *Dilophia*, *Pleurospermum*, *Cremanthodium* (better treated as a section of *Senecio*), *Oreosolen*, *Rheum* and *Littledalea*; the last a very pretty and distinct new genus of grasses. *Oreosolen* is a singular genus of the Scrophularineæ, of which one species, a native of the northern Sikkim Himalaya, was previously only imperfectly known.

Some further remarks on this collection, by the Director, are reproduced in the current volume of the *Bulletin*, pp. 99–100.

Ranunculaceæ.

Anemone imbricata, *Maxim. Fl. Tangut.* p. 8. t. 22.

A diminutive species restricted to Tibet, and previously collected by Przewalsky and Rockhill only.

Delphinium brunonianum, *Royle, Illustr. Bot. Himal.* p. 56, Hook. f. Fl. Brit. Ind. i., p. 27; Bot. Mag. t. 5461.

This handsome species is common in the Ladak and Karakoram regions.

Delphinium Pylzowi, *Maxim.* in *Bull. Acad. Pétersb.* xxiii. (1877), p. 307; Regel's Gartenfl. 1876, p. 289, t. 879.

Amdo, in western Kansuh, Przewalsky, and Eastern Tibet, Rockhill.

Aconitum Napellus, *L.* var.; Hook. f. Fl. Brit. Ind. i. p. 28.

This very variable plant is spread all round the northern hemisphere. We have not exactly matched Mr. Littledale's specimen, which is remarkable in having a very leafy inflorescence.

Papaveraceæ.

Meconopsis horridula, *Hook. f. & Thoms. Fl. Ind.* 1, p. 252; Hook. f. Fl. Brit. Ind. 1, p. 118.

Sikkim Himalaya and collected in Tibet, both by Thorold and Rockhill.

Meconopsis integrifolia, *Franch.* in *Bull. Soc. Bot. France*, xxxviii. (1886), p. 389; Cathcartia integrifolia, Maxim. Mél. Biol. ix. p. 713.

This exceedingly showy plant was previously known from western Yunnan and Szechuen, and north-western Kansuh or Tangut.

Fumariaceæ.

Corydalis Boweri, *Hemsl.* in *Journ. Linn. Soc.* xxx., p. 108 (1895); Hook. Ic. Pl. t. 2468.

Described from a specimen collected in Tibet by Surgeon-Captain Thorold. It is very closely allied to, if not identical with, *C. mucronifera*, Maxim. Fl. Tangut. i., p. 51. t. 24, fig. 19–21.

Corydalis moorcroftiana, *Wall. Cat.* n. 1432, Hook. f. Fl. Brit. Ind. 1, p. 125.
Afghanistan, North-west India, and West Tibet.

Cruciferæ.

Draba fladnitzensis, *Wulf.*; Hook. f. Fl. Brit. Ind. i. p. 143.
Widely dispersed in northern alpine and arctic regions.

Capsella Thomsoni, *Hook. f.* in *Journ. Linn. Soc.* v., p. 172 (1861); Hook. f. Fl. Brit. Ind. 1, p. 159.
Karakoram, Ladak, and Tibet, at 17,500 ft., collected by Rockhill.

Dilophia salsa, *T. Thoms.* in *Hook. Kew Journ.* Bot. v., p. 20 (1853); Hook. f. Fl. Brit. Ind. i. p. 161.
Ladak, Tian-Schan mountains, and Amdo, Kansuh.

Caryophyllaceæ.

Lychnis apetala, *Linn. Sp. Pl.* p. 437; Hook. f. Fl. Brit. Ind. i., p. 222.
Alpine Himalaya, mountains of North Europe, Asia, and America, and arctic regions; but not reaching the European Alps.

Stellaria decumbens, *Edgew.* in *Trans. Linn. Soc.* xx., p. 35 (1846); Hook f. Fl. Brit. Ind. i. p. 234, and var. **pulvinata,** Edgew. et Hook. f. loc. cit. p. 235.
Alpine Himalaya, ascending to 18,000 ft. in Sikkim.

Stellaria subumbellata, *Edgew.* in *Hook. f. Fl. Brit. Ind.* i., p. 233.
Sikkim, Ladak, Nubra, and Karakoram, at 11,000 to 16,000 ft.

Arenaria musciformis, *Wall. Cat.* n. 6401; Hook. f. Fl. Brit. Ind. i., p. 237.
Alpine Himalaya, Karakoram, and Tibet at 15,000 to 18,000 ft.

Arenaria (§ Alsine) Littledalei, *Hemsl.*; annua? pusilla, glabra, dense ramosa, purpurascens, ramulis gracillimis, foliis carnosis semiteretibus brevibus vix acutis basi membranaceis vel scariosis cupulatim connatis, floribus minutis axillaribus vel pseudoterminalibus pedicellatis, pedicellis fructiferis accrescentibus, sepalis 4 carnosis in margine scariosis anguste lanceolatis vix acutis erectis supra capsulam conniventibus, petalis nullis, staminibus perfectis sæpius (an semper?) 2, capsula fere a basi 4-valvis, seminibus circiter 8 longe funiculatis lævibus.

Planta sesquipollicaris. *Folia* maxima 4 lin. longa. *Pedicelli* fructiferi usque ad 8 lin. longi. *Sepala* circiter 1 lin. longa capsulam excedentia. *Semina* $\frac{2}{10}$ lin. diametro.

Geraniaceæ.

Geranium collinum, *Steph.*; *Willd. Sp. Pl.* iii., p. 705; DC. Prodr. 1, p. 642; Hook. f. Fl. Brit. Ind. 1, p. 429.
Central and Southern Russia in Europe, Afghanistan, Himalayas, Central Asia, and Siberia.

Leguminosæ.

Thermopsis lanceolata, *R. Br.* in *Ait. Hort. Kew.* ed. 2, iii. p. 3; Ledeb. Fl. Ross. i., p. 510; Hemsl. in Journ. Linn. Soc. xxxiii., p. 150.
Central Asia and Siberia to North China.

Astragalus strictus, *Grah.;* Hook. f. Fl. Brit. Ind. ii., p. 124.
Widely spread in the Himalayan alpine region and Tibet.

Astragalus (*species indeterminata*). This has not been matched at Kew, but so many species have been described that are not represented in the Herbarium, that it is left undescribed.

Oxytropis cashmerica, *Camb.* in *Jaquem. Voy., Bot.* p. 38, t. 44; Hook. f., Fl. Brit. Ind. ii., p. 139.
Western Tibet and Kashmir.

Rosaceæ.

Potentilla fruticosa, *Linn. Sp. Pl.*, p. 495; Hook. f. Fl. Brit. Ind. ii., p. 347.
From the Pyrenees and Great Britain eastward, through Central Asia and the mountains of northern India to China and Japan.

Potentilla fruticosa, *Linn.* **var. pumila,** *Hook. f. Fl. Brit. Ind.* ii., p. 348. Potentilla Lindenbergii, *Lehm.* in *Otto Hamb. Gartenz.* vii. p. 339; Revis. Potent. t. 2.
This very marked form or variety is only known from great elevations in the Himalayas and Tibet.

Potentilla bifurca, *Linn. Sp. Pl.*, p. 497; Hook. f. Fl. Brit. Ind. ii., p. 353.
Caucasus and Taurus, in high alpine regions, eastward in the Himalayas and Central Asia to Mongolia.

Saxifragaceæ.

Saxifraga tangutica, *Engl.* in *Bull. Acad. St. Pétersb.* xxix., p. 114 (1883).
A very distinct species of which Kew previously possessed specimens collected by Przewalski in the mountains on either side of the Tetung river, a little to the north of Koko Nor.

Crassulaceæ.

Sedum tibeticum, *Hook. f. & Thoms.* in *Journ. Linn. Soc.* ii., p. 96; Hook. f. Fl. Brit. Ind. ii., p. 418.
North-west Himalaya and western Tibet.

Sedum (§ Rhodiola) rotundatum, *Hemsl.*; glabrum rhizomate crassissimo colorato multicauli, caulibus subcarnosis erectis simplicibus, internodiis quam folia brevioribus, foliis sessilibus carnosis oblongo-rotundatis vel interdum vere orbicularibus integris vel interdum obscurissime lobulatis, cymis parvis paucifloris, floribus (masculinis tantum visis) rubris parvis, sepalis carnosis brevibus ovato-oblongis obtusissimis, petalis linearibus obtusis, filamentis filiformis, carpellis fatuis validis.—*Hook. Ic. Pl.* t. 2469.

Rhizoma 1 poll. crassum. *Caules* circiter 6 poll. alti. *Folia* ½–1 poll. diametro. *Cymæ* fl. masc. vix 6 lin. diametro. *Sepala* 1 lin. longa. *Petala* 2–2½ lin. longa.

Sedum Przewalskii, *Maxim.* in *Bull. Acad. St. Pétersb.* xxix., p. 156.

Previously only known from the same region as *Saxifraga tangutica*, Engl.

Sedum quadrifidum, *Pall.*?

The species of this affinity are difficult to identify from dried specimens, and a satisfactory determination would involve the examination of a large number of specimens.

Halorageæ.

Myriophyllum verticillatum, *Linn. Sp. Pl.*, p. 992; Hook. f. Fl. Brit. Ind. ii., p. 433.

Widely spread in the northern hemisphere, including America.

Umbelliferæ.

Pleurospermum Hookeri, *C. B. Clarke*, var. **Thomsoni**, Hook. f. Fl. Brit. Ind. ii., p. 705.

Western Tibet.

Pleurospermum?

Probably new, but the specimens bear only very young inflorescences.

Caprifoliaceæ.

Lonicera hispida, *Pall.*; Hook. f. Fl. Brit. Ind. iii., p. 11; Lonicera bracteata, Royle Illustr. t. 53.

Himalayas, from Kashmir to Sikkim, Central Asia and Siberia.

Compositæ.

Aster tricephalus, *C. B. Clarke, Comp. Ind.* p. 43; Hook. f. Fl. Brit. Ind. iii., p. 250.

Previously only known from Sikkim, Himalaya at 13–15,000 ft.

Aster tibeticus, *Hook. f. Fl. Brit. Ind.* iii., p. 251.

Western Himalaya, Karakoram and Tibet.

Aster Bowerii, *Hemsl.* in *Journ. Linn. Soc.* xxx., p. 113.

Described from small specimens collected by Dr. Thorold. Mr. Littledale's specimen is much more vigorous, and bears ripe achenes, from which a figure has been prepared for *Hooker's Icones Plantarum*, t. 2495.

Leontopodium alpinum, *Cass.*, varietates; Hook. f. Fl. Brit. Ind. iii., p. 279.

Besides the ordinary form, which is abundant in the Himalayas and extends to China and Mandshuria, there is an elegant dwarf variety with spathulate leaves. In the Himalayas this plant exhibits a great range of variation from a moss-like condition, less than an inch high, up to a foot or more.

Artemisia Stracheyi, *Hook. f. & Thoms. ex C. B. Clarke, Comp. Ind.* p. 164; Hook. f. Fl. Brit. Ind. iii., p. 328.

Western Tibet, 15,000 to 17,000 ft.

Artemisia salsoloides, *Willd. Sp. Pl.* iii., p. 1832; Hook. f. Fl. Brit. Ind. iii., p. 321.

Caucasus, Siberia, Mongolia, North-western India and the adjoining part of Tibet.

Anaphalis xylorhiza, *Sch. Bip. ex Hook. f. Fl. Brit. Ind.* iii., p. 281.

Sikkim Himalaya, in the Tibetan region, and Kumaon. It was also collected by Thorold at an elevation of 15,500 ft.

Tanacetum tibeticum, *Hook. f. & Thoms. ex C. B. Clarke, Comp. Ind.* p. 154; Hook. f. Fl. Brit. Ind. iii., p. 319.

Western Tibet, Parang and Lanak passes. Also collected by Thorold in Central Tibet.

Senecio (§ Cremanthodium) goringensis, *Hemsl.*; perennis, nanus, albo-puberulus, caulibus 1–2-foliatis 1–2-cephalis, foliis crassiusculis subcoriaceis radicalibus longe petiolatis ovali-oblongis inconspicue calloso-denticulatis apice obtusis vel rotundatis basi in petiolum attenuatis costa crassiuscula venis immersis obsoletis, capitulis radiatis cernuis, bracteis involucri circiter 20 molliter pubescentibus fere ad medium connatis vix acutis, floribus radii circiter 20 luteis angustis bracteas fere dimidio excedentibus, floribus disci numerosis, achæniis glabris oblongis ut videtur compressis sed maturis pappo albo sericeo corollas tubulosas paullo excedente.

Planta 4–9 poll. alta. *Folia* absque petiolis 1¼–2 poll. longa, et ½–1 poll. lata; petiolis 2–3 poll. longis. *Capitula* circiter 1½ poll. lata. *Flores* radii cum achæniis circiter 9 lin. longi.

Senecio (§ Cremanthodium) Fletcheri, *Hemsl.*; perennis, nanus, capitulis exceptis glaber, caulibus 1–2-foliatis 1–2-cephalis, foliis crassis coriaceis vel subcarnosis oblongo-lanceolatis obtusiusculis basi inter se vaginantibus calloso-dentatis costa deorsum incrassata atropurpurea venis immersis obsoletis, capitulis radiatis cernuis, involucri bracteis herbaceis circiter 12 basi connatis anguste oblongo-lanceolatis vix acutis setuloso-hirsutis nigrescentibus, floribus radii 12–15 luteis oblongo-lanceolatis bracteas dimidio excedentibus, floribus disci numerosis ut videtur apice nigrescentibus vel purpurascentibus, achæniis glabris oblongis ut videtur compressis sed maturis non visis, pappo albo laxo fere plumoso sericeo corollas tubulosas paulo excendente.

Planta circiter 6 poll. alta. *Folia* radicalia 3–4 poll. longa et 8–10 lin. lata, caulina minora. *Capitula* 1½–2 poll. diametro. *Flores radii* cum achænio pollicares. *Flores disci* circiter semipollicares.

Named after Mr. W. Fletcher, who accompanied Mr. and Mrs. Littledale and took part in the work of the expedition.

Saussurea Thoroldi, *Hemsl. in Journ. Linn. Soc.* xxx., p. 115, t. 5 (1895).

Previously collected by Dr. Thorold, and specimens have recently been received at Kew, from St. Petersburg, collected in Zaidam by Przewalski, and in Szechuen by Martin.

Saussurea subulata, *C. B. Clarke, Comp. Ind.* p. 226; Hook. f. Fl. Brit. Ind. iii. p. 367.

Nubra and Yarkand, at 15,000 to 18,000 ft., and in Tibet by Dr. Thorold at 17,000 ft.

Taraxacum palustre, *DC. Fl. Fr.* iv., p. 45; DC. Prodr. vii., . 148; Hemsl. in Journ. Linn. Soc. xxx., p. 137.

Taraxacum officinale, var. parvula, *Hook. f. Fl. Brit. Ind.* iii., p. 401.

Throughout the Himalayas at 10,000 to 18,000; and all over Europe in montane, alpine and arctic regions.

PRIMULACEÆ.

Primula rotundifolia, *Wall. ex Roxb. Fl. Ind. ed. Carey*, ii., p. 18; Hook. f. Fl. Brit. Ind. iii., p. 483.

Himalayas from Kashmir to Sikkim.

Primula purpurea, *Royle, Illustr.* p. 311, t. 77, f. 2; Hook. f. Fl. Brit. Ind. iii., p. 490, *sub P. Stuartii*.

Upper Sikkim to the north-west Himalaya and contiguous countries.

BORAGINACEÆ.

Echinospermum sp.

Specimen too young and meagre for satisfactory determination.

SCROPHULARINEÆ.

Pedicularis rhinanthoides, *Schrenk in Fisch. & Mey. Enum.* p. 22; Hook. f. Fl. Brit. Ind. iv., p. 314; Prain in Ann. Bot. Gard. Calc. iii., p. 109, t. 1.

Himalaya Mountains, Western China, Turkestan, Tibet.

Pedicularis Przewalskii, *Maxim.* in *Bull. Acad. St. Pétersb.* xxiv., p. 55 (1878); Mél. Biol. x., p. 84, et xii., p. 787, t. 1, f. 2; Prain in Ann. Bot. Gard. Calc. iii., p. 120, t. 5.

Tibet, Szechuen, and Western Kansuh.

Oreosolen unguiculatus, *Hemsl.*; species habitu foliisque *O. Wattii* simillima, sed corolla valde inæqualiter bilabiata sat diversa; glabrescens, subacaulis, foliis subrosulatis crassis subcarnosis ovato-rotundatis vel fere orbicularibus inferne subito constrictis subpetiolatis grosse crenato-dentatis a basi 5–7-nervis, nervis venisque crassis laxe reticulatis subtus præsertim conspicuis, floribus paucis in axillis foliorum subsessilibus, calycis segmentis brevibus fere liberis lineari-oblongis subacutis, corollæ tubo gracillimo vere cylindrico labio superiore unguiculato bifido labio inferiore æqualiter trilobato lobis angustis oblongis obtusis, staminibus 4 vix exsertis, staminodio brevi subulato labio superiore prope sinum enato, ovario glabro stylo filiformi stamina superante.—*Hook Ic. Pl.* t. 2467.

Folia maxima 2 poll. diametro. *Flores* circiter pollicares. *Corollæ* labium superius inferiorem fere duplo superans.

LABIATÆ.

Nepeta decolorans, *Hemsl.*; fere omnino sericeo-hirsuta, albida, caulibus brevissimis adscendentibus, internodiis 2–3 inferioribus folia excedentibus, foliis radicalibus non visis, caulinis crassis mollibus rugosis venis crassis conspicuis brevissime petiolatis vel sessilibus interdum fere orbicularibus grosse crenatis basi nunc subcuneatis nunc subcordatis inferioribus minoribus distantibus superioribus floralibus majoribus confertissimis, pedunculis subtrifloris pedicellisque brevissimis, bracteolis setiformibus, calyce intus extusque villoso insigniter bilabiato, labio superiore dimidio longiore brevissime tridentato, inferiore bifido

dentibus omnibus acutis, corollæ labio superiore bilobato lobis rotundatis, labii inferioris lobis lateralibus dentiformibus, staminibus 2 posterioribus longioribus labium æquantibus, 2 anterioribus vix e tubo exsertis, nuculis glabris oblongis.—*Hook. Ic. Pl.* t. 2470.

Caules 2–3 poll. longi. *Folia* caulina inferiora 3–4 lin. diametro, maxima 1 poll. diametro. *Calyx* circiter 4 lin. longus. *Corolla* 8–9 lin. longa.

Phlomis rotata, *Benth. ex Hook. f. Fl. Brit. Ind.* iv., p. 694.
The inner ranges of Sikkim Himalaya at 13,600 ft., collected by Sir Joseph Hooker, and recently by Dungboo, one of Dr. King's native collectors. A singular plant almost exactly like *Oreosolen unguiculatus* in habit and foliage.

POLYGONACEÆ.

Polygonum sphærostachyum, *Meissn. Monog.* p. 53; Hook. f. Fl. Brit. Ind., v., p. 32; Bot. Mag. t. 6847.
Western Tibet and Gilgit to Sikkim at 11,000 to 15,000 ft.

Polygonum viviparum, *Linn. Sp. Pl.* p. 360; Hook. f. Fl. Brit. Ind., v., p. 31.
Widely spread in alpine and arctic regions in Europe, Asia, and America.

Polygonum (§ Aconogon) tibeticum, *Hemsl.;* perenne, nanum, undique glabrum, caulibus erectis gracilibus lignescentibus pauciramosis, internodiis quam folia brevioribus, stipulis amplis tenuissimis truncatis vel obliquis cito ad basin fissis, foliis brevissime petiolatis crassis vix coriaceis obovato-oblongis marginibus (in siccis) recurvis venis immersis inconspicuis, cymis parvis densis terminalibus brevissime pedunculatis pedicellis brevissimis, perianthii segmentis 5 valde inæqualibus obovato-spathulatis apice rotundatis stamina superantibus, staminibus 8 inæquilongis hypogynis, disco inter stamina et ovarium carnoso 8-lobato lobis ovoideis, ovario glabro, stylis brevissimis stigmatibus magnis capitatis, nuce ignota.—*Hook. Ic. Pl.* t. 2471.

Caules 8–12 poll. alti. *Folia* cum petiolo 1–1½ poll. longa. *Cymæ* (2 tantum visæ) 6–9 lin. diametro. *Flores* circiter 2½ lin. diametro.

Rheum spiciforme, *Royle Illustr.*, p. 318, t. 78; Hook. f. Fl. Brit. Ind., v., p. 55.
Afghanistan, North-west Himalaya, and adjoining countries.
Mr. Littledale's specimen consists of a young plant having quite small leaves, and no inflorescence; but there is a similar specimen in the Herbarium, from North Tibet, collected by Przewalski, and referred to this species by Maximowicz.

URTICACEÆ.

Urtica hyperborea, *Jacq. ex Wedd. in Arch. Mus. Par.* ix., p. 68 (1856); Hook. f. Fl. Brit. Ind. v., p. 548.
Eastern and southern Tibet, at 12,000 to 17,500 ft.

SALICACEÆ.

Salix Lapponum, *Linn. Sp. Pl.*, p. 1019; Ledeb. Fl. Ross. iii., p. 617.
Widely spread in cold, temperate, and arctic regions of Europe, Asia, and America.

CYPERACEÆ.

Scirpus Caricis, *Retz. Fl. Scand. Prod.*, p. 11; Hook. f. Fl. Brit. Ind. vi., p. 660.

Europe, West and Central Asia, and the mountains of North India.

Kobresia sp.

Mr. C. B. Clarke, who kindly examined this and the other Cyperaceæ in the collection, did not succeed in matching this in the Kew Herbarium, but the material is hardly sufficient for description.

Carex ustulata, *Wahl. in Vet. Akad. Nya. Handl. Stockh.*, p. 156 (1803); Hook. f. Fl. Brit. Ind. vi., p. 734.

Widely spread in the cold regions of the northern hemisphere, and ranging between 12,000 and 17,000 ft. in the mountains of North India.

GRAMINEÆ.

Littledalea, *Hemsl.*; Spiculæ variabiles, 2–8 floræ, laxe paniculatæ, graciliter pedicellatæ, rachilla inter flores elongata, glabra, juxta flores et supra glumas inferiores articulata; flores grandes, hermaphroditi vel supremo imperfecto. Glumæ 2 inferiores vacuæ, inæquales, quam florentes multo minores, ecarinatæ, obtusæ vel truncatæ, simul emarginatæ vel erosæ, muticæ, trinervatæ, nervis haud excurrentibus lateralibus medium non attingentibus; florentes amplæ, truncatæ vel rotundatæ, supra medium hyalinæ, muticæ, ecarinatæ, demum erosæ, basi insigniter callosæ, 7-nervatæ, nervis omnibus vix excurrentibus; palea multo minor, bifida, bicarinata. Stamina 3. Lodiculæ 2, tenues, angustæ, oblongæ, integræ. Styli brevissimi, stigmatibus late plumosis. Caryopsis immatura hirsuta.—Gramen ut videtur perenne, pulchrum, erectum, foliis planis brevibus. Panicula terminalis, angusta, ramulis sæpissime geminatis pedicellisque capillaribus. Spiculæ sæpe geminatæ, altera minore pedicello breviore.

L. tibetica, *Hemsl.*; culmis simplicibus graciliusculis glabris lævibus sæpissime (an semper?) bifoliatis (nodo unico tantum perspicuo) internodio superiore longissime exserto, vaginis laxis glabris vel inferioribus puberulis superioribus apertis, laminis brevibus linearibus subacutis valide striatis utrinque puberulis basi appendice setuliformi utrinque instructis, ligula folii caulini inferioris magna integra vel demum lacerata foliorum superiorum adnodum redacta, paniculæ ramulis sæpius floribus 4, floribus puberulis purpureis.—*Hook. Ic. Pl.* t. 2472.

Culmi 1½–2 ped. alti. *Lamina* foliorum caulinorum 2–3 poll. longa, radicalium longior sed culmis multo brevior. *Ligula* bene evoluta 2 lin. longa. *Panicula* 4–5 poll. longa, ramulis ½–2 poll. longis. *Spiculæ* maximæ pollicares. *Gluma exterior* circiter 3–lin. longa, secunda 4½ lin. longa. *Gluma florens* 6–7 lin. longa, aperta, 2 lin. lata. *Palea* circiter 4 lin. longa.

Agropyrum striatum, *Nees ex Steud. Syn. Pl. Gram.*, p. 346. Throughout the Himalayas at considerable altitudes.

FILICES.

Polypodium hastatum, *Thunb.*; *Hook. Sp., Fil. v., p.* 74.

Japan, Formosa, Corea, and nearly throughout China. It was also collected by Père David in Moupine, Eastern Tibet; but Mr. Littledale's locality is the most western yet known.

Agaricineæ.

Lentinus curtipes, *Massee;* pileo infundibuliformi coriaceo-lento pallide luteo centro saturatius colorato e centro radiatim squamuloso-maculato margine integro involuto, stipite solido duro curto pallido hic inde tomento pruinoso flavido obtecto, lamellis decurrentibus angustis distantibus albo-luteis acie minutissime crenulato, sporis lævibus hyalinis subsphæroideis 1–2-guttulatis 5–6μ diam.

Pileus 1¼ poll. diam. *Stipes* 4–5 lin. longus et 2–3 lin. crassus.

Allied to *L. Thwaitesii*, B. & Br., Ceylon, but differing in the scaly pileus, broader gills, and subglobose spores.

Agaricus (Naucoria) pediades, *Fries Epicr.*, p. 197.
Europe, Central Asia, North America, tropical and South Africa, Ceylon, South Australia, and New Zealand.

DXXXVII.—CEDAR TREE OF MOUNT MLANJE.

(*Widdringtonia Whytei*, Rendle.)

A note on the recently discovered native cedar tree of British Central Africa was published in the *Kew Bulletin* (1895, p. 189). The timber is described as "equal to the finest pine and easily worked." It is gratifying to find that this valuable and interesting tree is likely to be carefully preserved in its present localities and also planted in the neighbourhood of the coffee estates in the Shiré Highlands.

The following further information respecting it has been communicated by the Secretary of State for Foreign Affairs:—

The Foreign Office to Royal Gardens, Kew.

Sir, Foreign Office, March 25, 1896.

I am directed by the Secretary of State for Foreign Affairs to transmit to you, to be laid before the Director, the accompanying copy of a despatch containing a report on the cedar forests at Mlanje in British Central Africa.

I am, &c.
H. Percy Anderson.

The Assistant Director,
Royal Gardens, Kew.

[Enclosure.]

Commissioner Johnston to the Marquess of Salisbury.

(No. 151. Central Africa.) The Residency, Zomba,
31st December, 1895.

My Lord,

The following extract from a Report by Mr. John McClounie, the Forester in the service of the British Central Africa Administration in charge of the Mlanje cedar forests, may be of interest to your Lordship.

Mr. McClounie writes:—

I have now been all over the Ruo Plateau, and the Luchenya, the Likubula Gorge, and the Tuchila Plateaux. The district round the source of the Tuchila is by far the best and most timbered part of the mountain. A few straggling trees are seen near the sources of the Ruo, and only one of any size, while the Luchenya is dotted with cedar along

its slopes. The Likubula is well wooded, but the forests are almost inaccessible. On the plateau round the source of the Tuchila the ground is covered with compact cedar forests, and may be estimated at 700 to 800 acres; on that around the Likubula about 200 acres, and a further 100 acres round about the Luchenya. Giving the number of trees to the acre as 150, the total number of full-grown existing cedar trees would stand at about 150,000, with an average of 40 cubic feet of timber each. At the present value of 3*s.* per cubic foot the total value of these trees would be 900,000*l.*; but if this timber was sold as it ought to be at 6*s.* a cubic foot the wealth would be doubled. As I have gone all over the woods and noticed quantity and quality, these figures may be taken as near the mark. It is abundantly in evidence that the whole of the plateau was at one time covered with cedar, as in recent diggings cedar roots were met with where there was no trace of them on the surface. Without doubt, fire has been the destructive agent, and it can easily be imagined as the under-growth gets tall and thick that at the dry season a gust of wind would fan a flame into an immense conflagration, and this cedar wood being exceedingly full of ignitible resins, a large tract of forest would soon disappear. Consequently, there ensues a decrease in rainfall, and then come further fires to complete the destruction; which destruction has been so nearly total that this valuable tree is now only to be met with on the upper plateau of Mlanje in damp places, and along the streams. It is no exaggeration to say that five or six years more delay in the assumption of control over the remaining patches of cedar forest would have meant the entire extinction of this unique conifer which there is abundant evidence to show once inhabited all the high mountains and plateaux in the southern part of British Central Africa.

Up to the present I have cut up nothing but dead wood, which, in most cases, is in good seasonable condition. The supply of timber yearly might be considerable, and not materially affect the forests for many years, especially as there are large numbers of young trees growing up in all the woods which must now be protected from fire.

I have this season sown a large quantity of cedar-seed which should be ready in a year to transplant, the ground to be planted must be thoroughly hoed and cleaned to remove grass, &c., and prevent fires.

Possibly this extract from Mr. McClounie's Report may be of interest to the authorities at Kew. I do not forward the whole of the Report as it deals with other matters, and will be eventually merged in the annual Report from this office.

I have, &c.
(Signed) H. H. Johnston.

DXXXVIII.—MISCELLANEOUS NOTES.

Mr. Thomas James Harris, a member of the gardening staff at Kew has been appointed by the Secretary of State for the Colonies Superintendent of the King's House Gardens and Grounds, Jamaica. He left for the West Indies on October 7th last.

Mr. Eugene Campbell, trained at the Botanical Gardens, Jamaica, and latterly Superintendent of King's House Gardens and Grounds

in that island, has been appointed Curator of the Botanic Station at Belize, British Honduras. He was to leave Jamaica for Belize at the beginning of October.

Mr. James E. Hartley, a foreman at the Hope Botanical Gardens, Jamaica, has been appointed Overseer of the Botanic Station at Sierra Leone. He will be engaged, under the Curator, Mr. Willey, in the experimental cultivation of coffee and cacao and in training native boys in horticultural work. Mr. Hartley spent a short time at Kew on his way to West Africa.

News of the unexpected death on October 9th of the eminent Australian botanist, Sir Ferdinand von Mueller, reached London on October 10th. In this place some record should be given of his connection with Kew and his services to the establishment during a period of nearly 50 years.

F. Mueller was born at Rostock in 1825, educated at Kiel, and began his botanical career by devoting several years to the investigation of the Flora of Schleswig-Holstein. In consequence of symptoms of phthisis, he emigrated to Australia in 1847, and at once commenced the study of the native flora; a study he must have continued almost to the day of his death, for Kew received some seeds from him the very day of the announcement. But it may, perhaps, be regarded as a significant fact that no written communication accompanied the packet, though it was addressed in his own hand. A later mail (October 19) has brought further news from him, but no reference to indisposition.

In the official correspondence of the period of Sir William Hooker's Directorship of Kew, the first communication from Mueller is dated February, 1853, and was written in pencil at his first camp, on his first journey to the Australian Alps. It announces his appointment, by the "scientific" Lieutenant Governor La Trobe, as Government Botanist; a post he held until his death. At this early date he spoke of a project he had conceived of writing a Flora of the whole of Australia, estimating the number of species at 10,000. He also proposed an interchange of ideas, an exchange of plants and seeds, and requested assistance in the revision and publication of his manuscripts relating to the flora of the continent. The correspondence thus begun has been continued with unflagging vigour with Kew, and, it may be added, with great advantage to both sides. During the same year (1853) two of his papers, which had previously been read before the Linnean Society, were published in *Hooker's Kew Journal of Botany*. These were succeeded by an unceasing outpour of papers, published in numerous European and Colonial periodicals, and by many important independent works, to specify which would fill pages of the *Bulletin*. From the very beginning of his career and onward he most liberally supplied Kew with sets of plants collected by himself on his various journeys, amounting to some 25,000 miles, and by others, at his instigation and often partly at his expense. His two first consignments, received in the fifties, exceeded 2000 species. The most extended journey he made was as botanist to the Gregory Expedition, across North Australia; and his narrative of this journey in *Hooker's Kew Journal of Botany*, vols. viii. and ix., is one of his most interesting contributions to our knowledge of the vegetation of Australia, from actual observation. In one of these communications he says: "You receive always the whole of the specimens of every

rare kind . . . . the plants being so much more useful at Kew than in Australia." He also expressed a strong desire to be able to return to Europe and work out his extensive collections at Kew, as he was fully aware that it was impossible to do it satisfactorily in Australia. This desire was never realised, and when, in 1861, the Australian Colonies, mainly through his exertions, agreed to grant funds for the publication of a general Flora of the country, he generously acceded to the view held by many botanists, that for so important an undertaking the labour should be secured of the most experienced and skilful of British descriptive Botanists, Mr. G. Bentham, with the admirable result known to all. He not only relinquished a work he had set his heart upon, but cordially assisted Mr. Bentham and transmitted the whole of his vast herbarium to Kew for the purpose. In the meantime he had published in his *Fragmenta* and elsewhere a large number of the novelties in his collections. Seldom a mail arrived without bringing some contribution from him to the herbarium, museum or garden. In 1857 Mueller was appointed Director of the Melbourne Botanic Garden, a post which he held until 1873, when he was superseded in consequence of not meeting popular demands as to the decoration of the garden. This was a source of great grief to him; yet there is no doubt there was some justification for the step, because in spite of his immense enthusiasm he was a somewhat unpractical man. He could plan better than he could carry into effect, as is exemplified by the fact that nobody did more to aid and encourage agricultural and horticultural industries by his pen and his extensive connection among the botanists and horticulturists of all countries.

Australia loses in him one of her most eminent scientific men, one of her greatest benefactors, and one of those men who effect incalculable good in a young country. Kew has lost a most valued correspondent and constant supporter. His services were, however, not confined to Australia and Kew. India, France, Italy, Algeria, and North America are under great obligations to him for the introduction of Australian trees, especially Eucalypti and Myrtaceae, now assuming forest proportions; and the gardens of the Riviera are largely indebted to him for flowering shrubs from the Antipodes that attract the attention of many visitors to that winter resort of all Northern Europe.

A note was published in the *Kew Bulletin* (see *ante*, p. 147) announcing the retirement, on account of ill-health, of Dr. Trimen, F.R.S., Director of the Royal Botanic Gardens, Ceylon. Since then news of his death has been received in this country with general regret. He died at Peradeniya on the 16th October in his 53rd year. In his last letter to Kew, dated August 30, he mentioned that he wrote lying on his back, after ten days' bed, having quite lost the use of his legs. Still he wrote cheerfully and hopefully, and, with regard to the *Handbook of the Flora of Ceylon*, his *magnum opus*, he remarked: "I do hope I shall be able to finish it, but there is much hard work to be done yet." It appears that he rallied, and struggled on with his work; but on the 15th ult. a telegram was received by his brother in England that he had had another serious attack, and sixteen hours later his death was reported.

Henry Trimen was born in London in 1843, educated at King's College, and graduated M.B. in the University of London in 1865. He devoted himself entirely to botany, and was Lecturer on Botany at St. Mary's Hospital Medical School from 1867 to 1872. In these early years he was an ardent student of British botany; took an active part

in the Botanical Exchange Club, and published, jointly with Mr. W. T. Thiselton-Dyer, a *Flora of Middlesex* in 1869. He was also the first to discover *Lemna arrhiza* in England. In 1869 he was appointed Senior Assistant in the Botanical Department of the British Museum, a post he held until the end of 1879, when he accepted the Directorship of the Ceylon Botanic Gardens. Between 1875 and 1880 he was associated with Professor R. Bentley in the publication of their well-known *Medicinal Plants*; and he was editor of the *Journal of Botany*, founded by Dr. B. Seemann, from 1872 to 1879, a task he performed with great tact and judgment, besides being a considerable contributor to its pages. Indeed all his work was of a very thorough and finished character, the outcome of patient research, discrimination, and aptitude. It is a pity that his admirable *Handbook of the Flora of Ceylon* (see *Kew Bulletin*, 1894, pp. 34 and 227, and 1895, p. 236) is left unfinished. It will be most difficult to find a botanist who could complete it on the same lines. In previous references to his work no mention has been made of the maladies from which Dr. Trimen suffered during the last few years of his life, but there is no longer any reason for reticence. Absolute deafness, and total paralysis of the legs, both of gradual development, and accompanied by other infirmities and derangements, were borne with fortitude and cheerfulness up to the last. This was in accord with his general character and kind, amiable disposition.

Botanical Magazine for October.—The Japanese *Actinidia polygama*, which is the subject of plate 7497, was drawn from a specimen sent to Kew by the Rev. Canon Ellacombe, of Bitton, in whose garden it flowered in June, 1895. *Alocasia reversa*, *Lathyrus undulatus*, *Fritillaria nobilis*, and *Parrotia jacquemontiana* were drawn from plants in the Kew collection. The *Alocasia*, native of the Philippine Islands, has, like other species of the genus, large, ornamental foliage. It was imported by Messrs. Sander, of St. Albans, and a plant was presented by them to Kew. *Lathyrus undulatus* (better known in gardens as *L. Sibthorpii*), from the shores of the Dardanelles, is closely allied to *L. rotundifolius* and *L. latifolius*. The *Fritillaria* is a native of Armenia, and bulbs were presented to Kew by Mr. Max Leichtlin. *Parrotia jacquemontiana* was raised from seeds received from Mr. Robert Ellis, of the Forest Department, Punjab.

Botanical Survey of India.—An interesting Report of the progress of the survey has been issued by Dr. King, C.I.E., F.R.S., the Director. The most important portion relates to the survey of Northern India. The following is Dr. King's summary of the results :—

The report for the year was submitted by Mr. J. F. Duthie. He did not himself undertake any exploratory tour during the year; but useful collecting work was done in Waziristan by means of native collectors. Part of Mr. Duthie's time was occupied in examining and naming various collections sent from Chitral by officers belonging to the field force, one of which in particular, sent by General Gatacre, C.B., contained plants of special interest; and part was occupied in useful herbarium work at Saharunpur; in visiting the Usar Reserves and the public gardens, in Northern India; and in conducting examinations at the Forest School. It was not found possible by Government to permit Mr. Duthie to accompany the Pamir Delimitation Commission, and the work of botanical collection was accordingly delegated to Surgeon-

Captain Alcock, I.M.S., who accompanied the expedition as Surgeon Naturalist. Dr. Alcock brought back a most interesting collection, which is now being worked up by Mr. Duthie. The result will be published, I understand, in a volume on the Natural History of the Pamir Boundary Commission, which it is intended to issue.

Castilloa elastica in Trinidad.—Mr. J. H. Hart, F.L.S., Superintendent of the Botanic Gardens at Trinidad, writes :—" We have raised and sold some 10,000 *Castilloa* this year, and we have a plantation in Tobago, and one here ready for bleeding."

Minor Industries in Bermuda.—In the *Report* for 1895, on the Colony of Bermuda [Colonial Reports, Annual, 1896, No. 166], the following particulars are given respecting its cultural industries :—

The principal exports to the United States were onions, valued at 44,424*l.*, a decrease compared with the preceding year of 990*l.*, and compared with 1893 a decrease of 15,446*l.*, lily bulbs, valued at 28,370*l.*, an increase compared with the preceding year of 11,248*l.*, and potatos, 26,495*l.*, an increase of 7,778*l.*

The decrease in value of the onions exported during 1895 was due to a fall in price in the New York market, the crop having been much larger than that of the preceding year. In the case of potatos the increase may be accounted for by the larger crop raised, and in the case of lily bulbs the increase was due partly to better prices and partly to larger crops.

Director of Agriculture, Zanzibar.—In the *Kew Bulletin* for the current year (pp. 80–86), some account is given of the present state of botanical enterprise on the east coast of Africa. As will be seen from the following communication an important step has now been taken by the Government of Zanzibar in the appointment of a Director of Agriculture :—

DIRECTOR OF AGRICULTURE, ZANZIBAR, to ROYAL GARDENS, KEW.

H. H. The Sultan of Zanzibar's
Government Offices, Zanzibar,
October 1, 1896.

DEAR SIR,

THE Government of Zanzibar have decided to appoint a Director of Agriculture, and have selected me for the post.

Their object in creating the post is to improve, where possible, the methods under which the agriculture of the country is now carried on, and to endeavour by experiment to discover some new product that may to a certain extent take the place of cloves. The Government desire that the work so admirably begun by Sir John Kirk when he was Consul General there, and since interrupted, may be continued.

* * * *

I am, &c.,
R. N. LYNE.

W. T. Thiselton-Dyer, Esq., C.M.G., &c.,
Director, Royal Gardens, Kew.

Mr. Robert Nunez Lyne, obtained a diploma and first class honours in the Canterbury Agricultural College, University of New Zealand; he has held the posts of Lecturer on Agriculture and Botany, Wellingore Hall Agricultural College (near Lincoln), and Lecturer on Agriculture under the Lincolnshire County Council. He is a member of the Royal Agricultural Society of England.

Chinese Liquorice.—In reference to the article in the *Kew Bulletin* (1894, pp. 141–146) Dr. Bretschneider draws attention to the particulars respecting the Chinese drug published by him in his *Botanicon Sinicum* (Part iii., p. 15) :—

Liquorice, places of production :—Chili, Shantung, Shensi, Kansu. Newchwang exported in 1885 to other Chinese ports 1767 piculs, Tientsin exported 4576 piculs, Chefoo exported 8690, Hankow exported 1148.

In 1882 I sent some specimens of Chinese liquorice root from Shansi to Dr. Flückiger, who in the second edition of his *Pharmacognosie* (p. 355) writes that he is not able to distinguish it from Spanish liquorice of the first quality.

The liquorice root used in medicine in Europe is derived from *Glycyrrhiza glabra*, L., indigenous in Southern Europe. The typical form of this supplies the Spanish liquorice, which is considered to be the best. The variety *glandulifera*, which grows in Hungary and South Russia, yields the Russian liquorice; this is also derived from *G. echinata*, L.

Loureiro (*Fl. Cochin.*, 543) states that Chinese liquorice root is yielded by *G. echinata* and *glabra* of the northern provinces of China. (*See* my *Early Europ. Res. Fl. China*, p. 145.)

Bunge (*Enum. Pl. Chinæ Bor.*, 97) records *G. glandulifera* from the neighbourhood of Peking and the Great Wall.

Przevalsky (*Mongolia, Tangut, &c.*, Engl. edition 1, 191) states that the root of *G. uralensis*, Fischer, one of the characteristic plants of the Ordos, is dug up there by the Mongols, hired by the Chinese, who despatch the drug down the Huang-ho to supply the Chinese markets. The same plant is recorded by Father David (Franchet, *Plantæ Davidianæ, Mongol.*, 93) from the Peking Plain and Southern Mongolia. It grows also in the Altai and Ural Mountains.

Dates.—In reference to the notes on Date Cultivation in Australia (*Kew Bulletin*, 1895, pp. 161–2) and Antigua (1895, pp. 26–28) the following brief account of what may be considered the normal growth of the tree will be useful for comparison :—

EXTRACT from the Report for the year 1894–95 on the Trade of the Kerman Consular District, Persian Beluchistan (F.O. 1896, Annual Series, No. 1671, p. 7).

Dates grow to great perfection in many parts of the country, notably at Pahraj and Fanoch. The output could be easily doubled by planting fresh palm groves.

Date palms begin to yield at three years, and reach their prime at 30. A good crop for a single tree would be from 80 to 100 lbs. They are fertilised by hand, one male tree supplying pollen for perhaps 40 female plants. The dates used for export are those that grow at the summit of the tree. From the action of the sun they become hard and dry, thus being easily packed. The lower branches remain soft, and are kept for local consumption.

Tulip-tree Wood for Cigar boxes.—The following note appears in *Garden and Forest*, for January 29th, 1896 (p. 50) :—

"Formerly Cuban and domestic cigar boxes were all made from the wood of the Spanish Cedar, a species of West Indian Cedrela, but now the demand for boxes to hold cheap domestic cigars is so great in this country that other woods, stained to resemble Spanish Cedar, are largely used for the purpose. The wood of the Tulip Poplar, *Liriodendron tulipifera*, is considered the best of the North American woods for this purpose, although chestnut, butternut, elm, basswood, and cottonwood have been tried. Cigar boxes are also now very largely made in the United States with veneers of Spanish Cedar cut in thicknesses of from eighty to one hundred and twenty sheets to one inch, and mounted on cheap American woods like cottonwood or basswood."

A new Brazil wood.—*Cæsalpinia bicolor*, C. H. Wright, is a small leguminous tree 15 to 20 feet high. It has several stems thrown up from the base "none of which are over three inches in diameter." The branches are scantily armed with thorns, the leaves are bipinnate with eight to 12 alternate ovate-emarginate leaflets; flowers red-purple with a flat broad pod, 2 inches long and about an inch wide, containing five seeds. Specimens in the Kew Herbarium are from Chachapoyas in Peru, collected by Lobb; from Vitor, collected by Maclean; and from Patia Valley, 1000 to 1500 feet, and Magdalena Valley, near Garzon, in Columbia, collected by Mr. R. B. White. The first specimens from the latter were received in 1869. They were then recognised as probably new; but it was only in September 1895 that adequate material was received for a description (*see Kew Bulletin*, 1896, p. 22). Accompanying this Mr. White forwarded the following particulars :—

"A *Cæsalpinia* yielding a very fine Brazil wood, said by Prof. Oliver to be undescribed. The dye from this wood was ascertained by the late Daniel Hanbury to be superior to that yielded by the best Pernambuco Brazil wood."

In the Guide to Museum I. p. 55, it is stated that "Peach Wood, Brazil Wood and Lima Wood (dye woods) are usually attributed to *Cæsalpinia echinata*. The sources of these woods are, however, not satisfactorily known. Authentic specimens of leaves and flowers would be valuable." It is possible therefore that in *Cæsalpinia bicolor* we have a source of one of the above woods not yet recognised. Mr. White has been asked to forward specimens of the wood for the Museums of Economic Botany at Kew, and on the arrival of these, their value for dye purposes will then be tested.

New Method of treating the Vanilla Pod.—A communication, dated 22nd May last, has been received at the Foreign Office from Mr. Courtenay Bennett, Her Majesty's Consul at Réunion, inclosing extracts from the *Indépendant Créole* of Réunion, containing a paper read by M. Dolabartz, Manager in Réunion of the Crédit Foncier Colonial, at a recent meeting of the Réunion Syndicat Agricole upon a new process of treating the vanilla pod:—

According to M. Dolabartz the operation consists of drying the vanilla in an hermetically closed vessel by means of chloride of calcium in the proportion of about one kilog. for every kilog. of dried vanilla obtained. The chloride of calcium is not lost, as it can be easily regenerated by heating it in an iron or copper receptacle; one lot of chloride of calcium is thus sufficient for several processes if kept, after regeneration, in an hermetically closed vessel.

According to information received, 2·981 kilogs. of raw vanilla will produce about a kilog. of prepared vanilla.

It can be easily understood that vanilla dried in an air-tight vessel must lose much less vanilline than when dried by the ordinary process, by which it is exposed in the open air for several weeks. (*Board of Trade Journal*, August 1896.)

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 120.] DECEMBER. [1896.

DXXXIX.—A RETROSPECT, 1887–96.

The completion of the tenth annual volume of the *Kew Bulletin* has made it desirable to publish a detailed index to the whole series. As the number of volumes has increased it has become more difficult to find the information they may contain on any particular subject.

The opportunity may be taken to pass in review briefly the more important subjects which have been treated. This will have the more interest as the period covered has been one of more than usual activity in the development of our tropical possessions.

Kew, from its first establishment as a national institution in 1841, has always been applied to by men of business desirous of engaging in new industries. Response to individual enquiries gradually came to be regarded as insufficient, and a demand arose for the prompt publication for general use of any information likely to be of service to those engaged in colonial pursuits. With this object the first number of the *Bulletin* was issued in January 1887. But it was also intended to serve another purpose. When public attention is engaged by any particular subject, enquiries about it are numerous. To say all there is to be said about it, once for all, in the pages of the *Bulletin* effects a great saving in labour. To quote the prefatory notice to the first number:—

"It is hoped that while these notes will serve the purpose of an expeditious mode of communication to the numerous correspondents of Kew in distant parts of the Empire, they may also be of service to members of the general public interested in planting or agricultural business in India and the colonies."

On March 18, 1887, the First Commissioner of Her Majesty's Works and Public Buildings (Mr. Plunket) informed the House of Commons:—"In response to the demands for the publication more speedily than in the annual report of information received from abroad, I have sanctioned the publication of a monthly bulletin, which can be purchased for a small sum."

Publication was originally intended to be "occasional." It has not been found practically possible to keep up an absolutely regular monthly issue. This, however, has been approached as nearly as circumstances would allow.

The original intention was to confine the *Bulletin* to colonial and commercial information. The suggestion of a larger scope having been

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raised in Parliament, especially with regard to reports on expeditions, the materials collected by which had been entrusted to Kew, to notices of interesting plants or objects received and the important plants sent out, Mr. Plunket further decided that the "*Bulletin* . . . should be made the vehicle of all printed matter suitable for its pages, which it is desirable to issue from" Kew. As a sequel the *Bulletin* became, what it remains, a continuous record of Kew work in all its various aspects.

Botanic Stations.

The establishment and development of the institutions known as Botanic Stations belongs almost entirely to the period under review. These stations were first suggested in 1885 to meet the special requirements of the smaller islands in the West Indies (*K.B.*, 1887, June 1–12) where "a great want was felt for reliable information on the culture of new economic plants and plain practical hints as to the best means to be employed for rendering them of the greatest value" (p. 7). This information was intended to be supplied by a regular system of bulletins supplemented by the maintenance of stations with nurseries attached for supplying seeds and plants. The officers in charge of the stations were men selected mostly from Kew, with a sound knowledge of gardening and capable of showing experimentally the conditions under which tropical economic plants might best be utilized as objects of remunerative industry.

The scheme met with the approval of the late Earl of Derby, and has been supported by successive Secretaries of State.

The details of its working have devolved largely on Kew, which has been continuously drawn upon for men, plants, advice, and information.

The first Botanic Stations were started at Grenada and Barbados, in 1886. These were soon followed by similar stations at St. Lucia (1889), Dominica and other islands in the Leeward Group (1889), St. Vincent (1890), and afterwards at British Honduras (1894). There are now nine stations in all in the West Indies.

The Grenada station was established on a spot just outside the town of St. George, described by the Governor as a "good site, well watered, accessible, and apparently suitable in every way." The first grant was 300*l.*, with a further sum of 1,000*l.* towards establishing and laying out the garden and providing a house for the curator. The objects of this garden were stated as follows: "To introduce and distribute plants of great economic value, to supply practical hints respecting new and promising industries, and to develop and improve existing minor industries" (*K.B.*, 1887, June 12). An account of the interesting station at St. Vincent, established on the site of the old botanic garden that existed from 1765 to 1823, was given with a drawing of the curator's house (*K.B.*, 1892, 92). Several references are made to the excellent work done at the Botanic Garden at Dominica, which promises to be one of the most attractive and useful in the West Indies (*K.B.*, 1893, 148).

Following the example of the West Indies, there have been established five Botanic Stations on the West Coast of Africa. The earliest was started at Lagos by Sir Alfred Moloney in 1888; the next at Aburi on the Gold Coast, in which Sir W. Brandford Griffith took a deep personal interest, in 1890. Since then stations have been established both at the Gambia (1894), in the Niger Coast Protectorate (1891), and at Sierra Leone (1895). A further station has been established in Fiji by the efforts of Sir John Thurston (1889). The results attained by

these Botanic Stations have been so promising that a strong wish has been expressed by the local authorities to obtain similar institutions at Bermuda, Bahamas, and the Seychelles.

Fruit Trade.

One of the most interesting developments in Colonial enterprise in recent years has been the increasing trade in fruit. Jamaica led the way, largely owing to the encouragement of the late Sir Anthony Musgrave, by supplying the United States with bananas and oranges that hitherto had had no local commercial value. The Jamaica fruit trade is now of the annual value of more than half a million sterling, and employs a considerable number of vessels wholly engaged in it. The trade in fruit between the Southern Colonies of the Old World (the Cape and Australia) and the mother country, is another instance of commercial activity in a new direction. It is not yet ten years old, but the value of the fruit annually imported is very considerable. The first steps in this direction were undertaken on the suggestion of Kew, and led to the excellent display of fruit made at the Colonial and Indian Exhibition in 1886. This showed so strikingly the capabilities of the Australian Colonies and the Cape to ship fresh fruit to this country during the winter months that considerable effort was made to establish what is now regarded as an important trade.

In the *Bulletin* for the years 1887 and 1888 will be found a summary of information not accessible in any other form in regard to the capabilities of various parts of the Empire for the production of fruit. This was brought together through the aid of reports obtained by the Secretary of State for the Colonies, and is still the most authoritative source of information on the subject. The efforts now being made to ship various tropical fruits from the West Indies direct to this country is another direction in which great results may ultimately be attained. The popular taste for the consumption of bananas is increasing. It has been shown that many such fruits can be brought to the home country in a fresh condition and find a ready market.

Information is also given respecting certain kinds that have been introduced with the aid of Kew from the West to the East Indies (*K.B.*, 1887, August, 1). Among these the Tree Tomato, the Chocho, and the Cherimoyer have proved useful additions to the food supply of hill stations in India and Ceylon. On the other hand new varieties of bananas and mangoes, the Durian and the Mangosteen have been transferred from the East to the West Indies.

Decades Kewenses.

Under the title of "Decades Kewenses" descriptions of plants new to science have reached the thirtieth decade. These are based on specimens contributed from every region on the earth's surface from the extreme heights of Tibet to the shores of the remotest islet in the Pacific Ocean. Further, owing to the increased impulse to exploration and commercial enterprise in Tropical Africa, it was thought desirable to publish at once, but in a separate series, brief diagnoses of new species. This has been done in the "Diagnoses Africanæ" (1894 to 1895).

Floras.

Besides these the vegetation of special regions investigated at Kew as the result of collections communicated by expeditions and travellers,

appear under numerous headings as the Flora of the Solomon Islands (*K.B.*, 1894, 211; 1895, 132, 159); of Aldabra Islands (*K.B.*, 1894, 146); of Formosa (*K.B.*, 1896, 65); of St. Vincent and adjacent islets (*K.B.*, 1893, 231); of the Gambia Delimitation Commission (*K.B.*, 1891, 268; 1892, 45); of the Sikkim-Tibet frontier (1893, 297); of Tibet (*K.B.*, 1894, 136); of the Hadramaut Expedition (*K.B.*, 1894, 328; 1895, 315); Siam plants (*K.B.*, 1895, 38). Amongst investigations of the economic products of various regions are articles on the Agricultural Industries of the Gambia (*K.B.*, 1889, 242); Economic plants of Madagascar (*K.B.*, 1890, 200); Agricultural resources of Zanzibar (*K.B.*, 1892, 87); Economic plants of Sierra Leone (*K.B.*, 1893, 167); and Plant industries of Lagos (*K.B.*, 1893, 180).

Orchids.

The cultivation of orchids is one of the most prominent features of English horticulture. Every part of the world is ransacked for them by collectors. Of no family of plants have more species been got together in a living state, and in no country are a greater number maintained under cultural conditions than in England. During his lifetime, the late Dr. Reichenbach, Professor of Botany at Hamburg, was the acknowledged authority for their nomenclature. On his death in 1889 vigorous public pressure was brought to bear on Kew to take up his work. This was done, though not without difficulty, in addition to its other duties, and in 1891 the publication of technical descriptions of new species was commenced. Twenty decades of "new orchids" have been published in the *Bulletin*.

Horticulture.

Of horticultural interest a list enumerating 766 species and varieties of orchids that flowered at Kew during the year 1890 has been published (*K.B.*, 1891, 52), affording useful information as to the time and duration of the flowering period of orchids cultivated in this country. The highest number of species flowered in one month was 125 in May; the lowest was 85 in January. Some species, as for instance *Cypripedium longifolium*, *Masdevallia pulvinaris*, and *Odontoglossum crispum*, were in flower all through the year.

The cultivation of tropical and sub-tropical plants on the Riviera was described (*K.B.*, 1889, 287), with notes on the principal palms, cycads, bamboos, agaves, and other succulent plants. To this was added a list of some of the most interesting other species established on the Riviera, revising in many cases the names under which they had hitherto been recognised. A further contribution was made to this subject by a paper written by Mr. J. G. Baker, F.R.S., on the agaves and arborescent liliaceæ on the Riviera (*K.B.*, 1892, 1). As few botanists have attended much to these plants it has been very difficult for cultivators to obtain names for their collections. A correct determination of cultivated Riviera plants is also of value to Kew, as it assists in the interchange or purchase of new and desirable specimens required for the establishment.

An important paper on horticulture and arboriculture in the United States, prepared by the curator, Mr. G. Nicholson, A.L.S., whilst on a visit, as a judge in horticulture at the Columbian Exposition at Chicago (*K.B.*, 1894, 37), has rendered it possible to obtain a more complete representation of the trees and shrubs of the United States in the

Arboretum of the Royal Gardens, and has brought before horticulturists in this country many interesting plants that had not hitherto received the attention they deserved. Nearer home, a paper on Horticulture in Cornwall (*K.B.*, 1893, 355), affords a fairly representative picture of the possibilities of Cornish horticulture, where, owing to the mildness of the climate, types of the vegetation of New Zealand and the Himalaya do better even than under glass at Kew. The "cultivation of vegetables for market" and the possibilities of market gardening in Great Britain (*K.B.*, 1895, 307) discusses an important economic problem.

Among other horticultural subjects dealt with are the storing of home-grown fruit (*K.B.*, 1895, 31, with an illustration of a fruit room), and a detailed account of the prune industry in France and California.

Plant Diseases.

The diseases of cultivated plants is a subject on which the aid of Kew is frequently sought on behalf of Colonial Governments by the Secretary of State for the Colonies. The investigation of fungoid diseases often demands considerable time and attention on the part of members of the Kew staff, while those caused by insects render it necessary to secure the assistance of specially qualified experts to whose courtesy this establishment is greatly indebted. The several diseases that have affected the sugar-cane in the West Indies, Queensland, and Mauritius have been described in a series of important articles extending over several years (1890–96) whilst diseases such as those affecting arrowroot in St. Vincent, bananas in Fiji, cocoa-nut in British Honduras, coffee in East Africa, onions in Bermuda, wheat in Cyprus, pepper in Mysore, potatos in India, vanilla in the Seychelles, have also been carefully dealt with. Of considerable practical value are articles on the preservation of grain from weevils (*K.B.*, 1890,144), and on the well-known plant malady called "anbury" and "finger and toe," which attacks turnips (*K.B.*, 1895, 129). It is shown that free acid present in the soil is favourable to the disease, while a free alkali is unfavourable.

Fibre Plants.

The large and increasing interest taken in fibre plants and the numerous references made to this establishment on the subject, rendered it desirable to place within reach of cultivators in India and the Colonies a summary of information respecting them. This is contained in a series of articles begun in 1887 and continued with more or less regularity to the present time. The total number amounts to about 70. As might be expected, those of chief importance relate to Sisal hemp and Ramie, or China grass, subjects which have received much attention in various parts of the Empire. These articles are of value, not only in encouraging the cultivation of plants yielding fibres likely to be in actual demand, and yielding remunerative results, but in preventing expenditure upon these that are known to be useless.

Many fibres have been traced to the plants yielding them for the first time. For instance, the Mexican whisk, or *Raiz de Zacaton*, was identified, from specimens communicated by the Foreign Office, as the root of a species of *Epicampes*, a grass distributed over the highlands of Mexico. The plants yielding the fibre called Istle, used, not for rope making, but as a substitute for animal bristles in the manufacture of cheap nail and scrubbing brushes, were found to belong to a group

of Agaves with short leaves, of which *Agave heteracantha, Zucc.*, is the type. The first information respecting African bass, a fibre obtained from *Raphia vinifera*, was published in the *Kew Bulletin* (*K.B.*, 1891, p. 1). This is now a regular article of export from our African Colonies; and the same thing may be said of the bass fibre obtained from the Palmyra palm in Ceylon (*K.B.*, 1892, 148), and of Madagascar Piassava yielded by a new species of *Dictyosperma* (*K.B.*, 1894, 358). A continuous account of the hemp industry in Yucatan, and of the similar industry lately started in the Bahamas, is given over the whole period. The origin of the white-rope fibres which appeared in commerce as Bombay aloe fibre, and as Manila aloe fibre, have been traced to *Agave vivipara*, a New World species now naturalised and fairly abundant in many parts of the East Indies (*K.B.*, 1893, 78).

The recent attempts to extract and to utilise the valuable fibres contained in the China grass (*Boehmeria nivea*), and Ramie or Rhea (*B. tenacissima*), have been placed on record in a series of articles which have been of considerable service to manufacturers in this country and also to our planting Colonies. The habits and requirements of the plants and the conditions necessary for their successful cultivation have been carefully discussed.

Rubber Plants.

The investigation of rubber-yielding plants has resulted in drawing attention not only to new sources of supply, but in increasing the quantity available for commercial purposes. The remarkable rubber industry started in the Colony of Lagos in 1889 is described (*K.B.*, 1895, p. 241), and a figure is given of the plant, which hitherto had not been known as a source of commercial rubber. The Lagos rubber industry in two years developed into an export value of nearly 400,000*l.* A somewhat similar industry had been started on the Gold Coast by the efforts of Sir Alfred Moloney, with exports in 1893 of the value of 218,162*l.* Practically all the more important sources of commercial rubber are reviewed, while particulars respecting new rubber plants such as *Forsteronia gracilis* in British Guiana, *F. floribunda* in Jamaica, and *Sapium glandulosum* in the United States of Columbia are also given. It may be added that information is desired by this establishment respecting the plants yielding the Esmeralda rubber of Guiana (*K.B.*, 1892, 70) and that exported from Matto-grosso in Brazil. There is a doubt as to the distinction, if any, existing between caoutchoucs yielded respectively by the Ule and Tuno trees of Central America. One of these is usually referred to *Castilloa elastica*, but botanical specimens are necessary of each tree to definitely decide the point.

Special Articles.

These include the results of investigations made at Kew into plants yielding Paraguay tea, or maté, so largely consumed as a beverage in South America (*K.B.*, 1872, 132); vanilla-yielding plants cultivated in tropical countries (*K.B.*, 1895, 169); the plants yielding Sisal hemp, (*K.B.*, 1892, 21); the timber of the Straits Settlements (*K.B.*, 1890, 112); the species and varieties of *Musa* cultivated for food or ornament (*K.B.*, 1894, 229); tropical fodder grasses (*K.B.*, 1894, 373; 1896, 115); Chinese white wax (*K.B.*, 1893, 84); the arrowroot industry of St. Vincent (*K.B.*, 1893, 191); tuberous Labiatæ (*K.B.*, 1894, 10); Canary rosewoods (*K.B.*, 1893, 133); American ginseng (*K.B.*, 1893,

71); palm weevil in British Honduras (*K.B.*, 1893, 27); and sheep bushes and salt bushes (*K.B.*, 1896, 129). In addition several articles have appeared describing the various forms in which tea is met with in European and Asiatic commerce. P'u-êrh tea is made into balls as big as a man's head, or into cakes; compressed or tablet tea is manufactured from tea dust by steam machinery, while another form known as brick tea is used in Chinese Mongolia and Tibet. Lao tea is not used for making an infusion, but prepared wholly for chewing purposes. A pickled tea, called Leppett tea, is eaten as a preserve with other articles. The white tea of Persia has been shown to consist of the undeveloped leaf-buds of China tea thickly coated with fine hairs giving them a silvery appearance. A singular beverage known as Faham tea is prepared in Mauritius from the leaves of an orchid (*Angræcum fragrans*) (*K.B.*, 1892, 181). This is described as agreeable and used as a digestive; it is even recommended in diseases of the respiratory organs. The leaves themselves mixed with ordinary tea impart to them an extremely pleasant perfume.

The discovery of seedling sugar-canes at Barbados (*K.B.*, 1889, 242) has rendered it practicable to raise new serviceable varieties, and probably to improve the yield of this valuable plant. A seedling raised at Kew has yielded excellent results in Queensland, and has been largely propagated under the name of "Kewensis" (*K.B.*, 1896, 167). The possibility of preparing a palatable butter from the oil of the cocoa-nut (*K.B.*, 1890, 230), is an instance of the advance made in the chemistry of familiar vegetable products. Canaigre (*K.B.*, 1890, 63) will probably prove a most valuable tanning agent, while the preparation of cutch from the bark of mangrove trees (*K.B.*, 1892, 227) may bring into profitable use stretches of vegetation in the tropics that have hitherto been regarded as perfectly useless. Amongst new economic plants should be mentioned *Coffea stenophylla*, the highland coffee of Sierra Leone (*K.B.*, 1896, 189) which in certain localities may prove a formidable rival of the Arabian coffee.

The publication of a note on Jarrah timber (*K.B.*, 1890, 188) has led to the extended use of this and similar Australian hard woods for the purpose of paving the carriageways of London streets instead of the cheaper but less durable white pine. The collections of Australian timbers in Museum III. were of special service in this direction.

A paper on Natural Sugar in Tobacco (*K.B.*, 1896, 49-55) recorded some scientific facts of great novelty and interest, and solved an important fiscal problem.

DRUGS.

Many little-known drugs have been investigated. The seeds of *Sophora secundiflora* have a singular use among the Indians of Mexico, where they are taken as an intoxicant. Half a seed is said to produce exhilaration followed by sleep lasting two or three days (*K.B.*, 1892, 216).

Derris elliptica, now growing in the Economic House at Kew, yields the Malayan fish poison known as "Aker Tuba" (*K.B.*, 1892, 216). From the account given of Natal Aloes and of the plants supposed to yield this product (*K.B.*, 1890, 163) it appears that it differs in some important respects from the more commonly known Cape Aloes. The discovery of the plant, also in the Kew collection, yielding the true Star Anise of commerce is noticed (*K.B.*, 1888, 173). The manufacture of quinine in India and the wide distribution at a nominal price of this valuable medicinal agent amongst the natives (*K.B.*, 1890, 29) is one

of the most important services which European rule has rendered to the Indian Empire. Paraguay Jaborandi (*Pilocarpus*) is discussed (*K.B.*, 1891, 179) from materials sent to this country by H.M.'s *chargé d'affaires* at Buenos Ayres in 1881. The origin of myrrh and frankincense is discussed in considerable detail (*K.B.*, 1896, 86), while the first authentic information respecting the district whence Siam Benzoin or Gum Benjamin of commerce is obtained is the subject of another article (*K.B.*, 1895, 154). Next to Gum Benjamin Siam Gamboge is the most interesting of Siamese products (*K.B.*, 1895, 139). The peculiar Ai Camphor prepared in China from a shrubby composite, a species of *Blumea*, is described (with a plate) from information supplied by Dr. Augustine Henry (*K.B.*, 1895, 275). The plants yielding the leaves known as coca, and the drug cocaine, with their characteristics, are discussed (*K.B.*, 1889, 1), with a suggestion that a plant long cultivated at Kew (*Erythroxylon Coca*, var. *novo granatense*) might be suited for cultivation at a lower elevation than the type. The little-known Iboga root of the Gaboon and Bocca of the Congo, possessing tonic properties, is traced to *Tabernanthe Iboga*, Baill. (*K.B.*, 1895, 37); the tree yielding the Ipoh poison of the Malay peninsula is identified with that yielding the Upas poison of Java (*K.B.*, 1891, 24), but the remarkable point is brought out that while in Java the Upas tree (*Antiaris toxicaria*) furnishes a very effective arrow poison, in the Malay peninsula the juice of what is regarded as an identical species is apparently innocuous and the defect is remedied by the use of arsenic.

Food Grains.

A series of articles on the Food Grains of India by Professor A. H. Church, F.R.S. (1888 to 1893), supplements the information contained in his published handbook on the same subject. The material for these investigations were supplied from the Museums of the Royal Gardens.

Miscellaneous Notes.

In 1891 a series of miscellaneous notes was begun in which were recorded appointments on the Kew staff as well as those made on the recommendation of Kew by the respective Secretaries of State to Colonial and Indian Botanical Gardens. The notes also included a record of contributions made to the gardens, herbarium, and museums, the movements of expeditions and travellers engaged in botanical exploration, notices of Kew publications, and facts of interest connected with the daily work of the establishment. Later there were added paragraphs on general economic subjects too short to appear as separate articles. The detailed index now published will afford the means of reference to these scattered notices.

Appendices.

The Appendices remain to be noticed. Of these three have been regularly issued at the end of each volume since 1891. Previously the information contained in them had appeared as one of the monthly numbers of the *Bulletin*. (1) Lists of seeds of hardy herbaceous and of trees and shrubs offered in exchange by Kew to Colonial, Indian, and Foreign Botanical Gardens; (2) Lists of new garden plants annually described in botanical and horticultural publications. These are

indispensable to the maintenance of a correct nomenclature in the smaller botanical establishments in correspondence with Kew, and afford information respecting new plants distributed from this establishment in regular course of exchange with other botanic gardens; (5) Lists of the staffs of the Royal Gardens, Kew, and of botanical establishments at home and in India and the Colonies in correspondence with Kew.

In Appendix III., 1890, will be found a complete index to the Reports on the Progress and Condition of the Royal Gardens, Kew, from 1862 to 1882. This index is useful as a means of easy reference to the numerous notices respecting economic and other plants.

CORRECTIONS.

In so varied a range of subjects some amount of error, it is hoped not considerable, doubtless exists. A few statements which subsequent research have shown to be probably erroneous must be corrected.

The case of poisoning from Turnsole (*Chrozophora tinctoria*) described in *K.B.*, 1889, 279–280, was in all probability not due to that plant, but to *Datura Stramonium*.

The source of the well-known Chinese preserved ginger, which in *K.B.*, 1891, 5, was attributed to *Alpinia Galanga*, ultimately appeared to be, as pointed out in *K.B.*, 1892, 16, the ordinary commercial plant, *Zingiber officinale*. Some mistake had been made apparently in the plants transmitted to Kew as yielding the commercial product.

The figure of a *Musa* given in *K.B.*, 1894, 247, as *Musa Fehi* may be identical with that species. But all that is certain about it is that it represents *M. Seemanni* of Baron von Mueller.

DXL.—MISCELLANEOUS NOTES.

Botanical Magazine for November.—The following plants, all cultivated at Kew, are figured: *Cycnoches Haagii*, *Rhododendron serpyllifolium* *Pentstemon azureus*, *Haworthia xiphiophylla*, and *Acantholimon venustum*. The *Cycnoches* is the fifth species to which a plate of the "Botanical Magazine" has been given. It is a native of Brazil, and was communicated to Kew by E. S. Rand, Esq., of Para. The *Rhododendron*, native of Japan, is a very small-flowered species, closely allied to *R. indicum* var. *amœnum*. The plant from which the drawing was made was purchased in 1895. The Californian *Pentstemon azureus* was raised from seeds sent to Kew in 1895 by Professor Goodale, director of the Botanic Garden of Harvard University. The *Haworthia*, a new species from Cape Colony, flowered for the first time at Kew in April of this year. It was received from Mr. C. Howlett, of Uitenhage. The *Acantholimon* has been growing in the Rock Garden for several years. It is a native of Asia Minor. The only other species cultivated in England, *A. glumaceum*, is figured in Moore and Ayres' "Magazine of Botany," Vol. II., p. 161, a fact overlooked in the "Botanical Magazine."

Completion of the Flora of British India.—With the exception of a general index, now almost ready for the press, this great work has been brought to a conclusion by the issue of the 22nd part, containing the remainder of the grasses. Sir Joseph Hooker will receive the congratulations of all botanists on the completion of a task to which he has devoted the greater part of the last quarter of a century, to say nothing of previous years of travel and preliminary labour. It would not be too much to say that it has occupied the best part of 50 years of his life, as he left England for India in 1847. The entire work will consist of seven octavo volumes, averaging 775 pages each, including the general index of about 42,000 names. The grasses alone number 850 species, belonging to 150 genera, and, as has been mentioned before, the synonymy is perhaps more copious and involved than that of any other family. Owing to the wide distribution of most of the genera, and many of the species of grasses, the volume treating of them has a general as well as a special value.

Annals of the Royal Botanic Garden, Calcutta.—The second part of the fifth and the entire seventh volume have just been issued simultaneously. The former consists of descriptions and figures of "a century of new and rare Indian plants" by P. Brühl, of the Bengal Educational Service, and Dr. G. King, superintendent of the Calcutta garden. Mr. Brühl is favourably known to botanists by his *De Ranunculaceis Indicis Disputationes,* and his part in the present work consists wholly of *Ranunculaceæ;* not new species, it is true, but a very careful elaboration of the critical forms of old species. *Coptis ospriocarpa* is the only one described as new. Twenty-seven plates are devoted to this part. Dr. King's consists mainly of interesting novelties described in his *Materials for a Flora of the Malayan Peninsula*, and belonging to the orders *Violaceæ*, *Bixineæ*, *Guttiferæ*, *Dipterocarpeæ*, and *Artocarpeæ*, &c.

The seventh volume of the *Annals* is a fully illustrated monograph of the *Bambuseæ* of British India, by J. S. Gamble, Conservator of Forests. Mr. Gamble has been working at Indian bamboos for some years, and his monograph is an immense advance on previous knowledge of this important group. The account of the *Bambuseæ* in Hooker's *Flora of British India* was "drawn up almost verbatim" from it. One hundred and fifteen species are described (increased to 117 in the *Flora of British India*), belonging to 15 genera, including one new one. Only a few species of bamboos flower annually, and in most species the flowering seasons come only at long intervals. Mr. Gamble gives all the information it was possible to procure on this and other points, but adds that there is much yet to be learnt.

Errata in the Present Volume.

Page 28, line 23 from top, *for* 13,588 *read* 83,588.
line 6 from bottom. By an oversight the contents of the Botanical Magazine for December refer to the issue of that month for 1895 and not to 1896.

Page 31, line 17 from top, *for* Cheradzulu *read* Chiradzulu.
line 20 from top, *for* genius *read* genus.
line 2 from bottom, *for meuse read mense.*

Page 32, line 7 from top, *for* Basse *read* Bosse.

Page 159, line 16 from top, *for* tenuisculis *read* tenuiusculis.

Page 161, line 35 from top, *for* bilocularis *read* bilocularibus.

Page 163, line 19 from top, *for* abio *read* labio.

Page 164, line 18 from top, *for* tuberis fusiformibus *read* tubera fusiformia.

Page 165, line 19 from the top, *for* scansdens *read* scandens.

Page 167, line 10 from top, *for* communi *read* communes.

Page 213, line 11 from bottom, *for* abium *read* labium *and for* inferiorem *read* inferius.

Page 216, line 6 from top, *for* crenulato *read* crenulatis.

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX I.—1896.

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a list of seeds of Hardy Herbaceous Annual and Perennial Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1895. These seeds are not sold to the general public, but are available for exchange with Colonial, Indian, and Foreign Botanic Gardens, as well as with regular correspondents of Kew. No application, except from remote colonial possessions, can be entertained after the end of March.

HERBACEOUS PLANTS.

Acaena cylindrostachya, *Ruiz & Pav.* Chili.
    macrostemon, *Hook. f.* N. Zealand.
    microphylla, *Hook. f.* N. Zealand.
    myriophylla, *Lindl.* Chili.
    ovalifolia, *Ruiz & Pav.* Peru, &c.
    pinnatifida, *Ruiz & Pav.* Chili.
    Sanguisorbae, *Vahl.* New Zealand.
    sericea, *Jacq.* Mexico.

Acanthus longifolius, *Poir.* S. Europe.

Achillea Ageratum, *L.* Europe.
    Clavennae, *L.* Europe.
    decolorans, *Schrad.* Europe.
    filipendulina, *Lam.* Orient.
    ligustica, *All.* Eur. Orient.
    Millefolium, *L.* Northern hemisphere.

Achilea—*cont.*
    Ptarmica, *L.* Northern hemisphere.
    rupestris, *Huter.* Calabria.
    setacea, *Waldst. & Kit.* Europe.
    tomentosa, *L.* Eur. N. Asia.
    Tournefortі, *DC.* Greece.
    umbellata, *Sib. & Sm.* Greece.

Aconitum heterophyllum, *Wall.* Himalaya.
    Lycoctonum, *L.* Europe, &c.
    — var. orientale, *Hort.*
    Napellus, *L.* N. hemisphere.
    — var. album.

Acroglochin chenopodioides, *Schrad.* Asia.

Actaea spicata, *L.* Northern hemisphere.

Actinolepis coronaria, *Gray.* California.

Actinomeris squarrosa, *Nutt.* N. America.

Adenophora liliifolia, *Bess.* Europe, &c.
Adesmia muricata, *DC.* Chili, &c.
Adlumia cirrhosa, *Rafin.* N. America.
Adonis aestivalis, *L.* Europe, Orient.
Ægopogon geminiflorus, *Humb. & Bonpl.* Trop. America.
Æthionema cappadocicum, *Spreng.* Orient.
  pulchellum, *Boiss.* Armenia.
  saxatile, *R.Br.* S. Europe.
Agrimonia Eupatoria, *L.* N. hemisphere.
  leucantha, *Kunze.* Origin uncertain.
  odorata, *Mill.* Europe.
Agropyron Aucheri, *Boiss.* Orient.
  dasyanthum, *Ledeb.* Russia.
  glaucum, *Roem. & Schult.* Europe.
  pungens, *Roem. & Schult.* Europe.
  — var. pycnanthum, *Godr.*
  tenerum, *Vasey.* N. America.
Agrostis alba, *L.* Europe.
  — var. gigantea, *Roth.*
  — var. stolonifera, (*L.*).
  nigra, *With.* Europe.
  vulgaris, *With.* Temp. regions.
Ajuga Chamaepitys, *Schreb.* Europe, &c.
Alchemilla alpina, *L.* N. hemisphere.
  conjuncta, *Bab.* N. W. Europe.
  fissa, *Schum.* Alps, Pyrenees, &c.
  vulgaris, *L.* Europe.
Alisma Plantago, *L.* Europe, &c.
Allium Ampeloprasum, *L.* Europe, Orient.
  angulosum, *L.* Siberia.
  atropurpureum, *Waldst. & Kit.* Hungary.
  Babingtoni, *Borrer.* Britain.
  bauerianum, *Baker.* Orient.
  cardiostemon, *Fisch. & Mey.* Persia.
  carinatum, *L.* Europe.
Allium—*cont.*
  Cydni, *Schott & Kotschy.* Asia Minor.
  Fetisowi, *Regel.* Turkestan.
  fistulosum, *L.* Siberia.
  flavum, *L.* Europe.
  giganteum, *Regel.* Central Asia.
  globosum, *Redouté.* Origin uncertain.
  — var. albidum.
  hymenorrhizum, *Ledeb.* Persia.
  — var. tenuifolium, *Regel.*
  kansuense, *Regel.* China.
  karataviense, *Regel.* Turkestan.
  Moly, *L.* Europe.
  montanum, *F. W. Schm.* Europe.
  narcissiflorum, *Vill.* Europe.
  nigrum, *L.* Europe.
  odorum, *L.* Siberia.
  ostrowskianum, *Regel.* Turkestan.
  polyphyllum, *Kar. & Kir.* Turkestan.
  pulchellum, *Don.* Europe.
  roseum, *L.* Mediterranean region.
  Schoenoprasum, *L.* N. hemisphere.
  — var. sibiricum, (*L.*).
  senescens, *L.* Europe, Siberia.
  subhirsutum, *L.* Europe.
  subvillosum, *Salzm.* S. W. Europe.
  Suworowi, *Regel.* Central Asia.
  urceolatum, *Regel.* Turkestan.
  ursinum, *L.* Europe, N. Asia.
  Victorialis, *L.* Europe, Siberia, &c.
Alonsoa incisifolia, *Ruiz & Pav.* Peru.
Alopecurus agrestis, *L.* Europe.
  arundinaceus, *Poir.* Europe, &c.
  geniculatus, *L.* N. hemisphere.
  pratensis, *L.* N. hemisphere.
  — var. fol. variegatis.

Alstroemeria aurantiaca, *Don.* Chili.
haemantha, *Ruiz & Pav.* Chili.

Althaea cannabina, *L.* Europe, var. narbonensis, *Pourr.*
ficifolia, *Cav.* Dalmatia.
Heldreichii, *Boiss.* Macedonia.
kregujevacencis, *Panc.* Orient.
lavateraeflora, *DC.* Syria.
pallida, *Waldst. & Kit.* Europe.
rosea, *Cav.* Orient.
sulphurea, *Boiss. & Hausskn.* Persia, &c.

Alyssum argenteum, *Vitm.* Europe.
creticum, *L.* Crete.
gemonense, *L.* Europe.
incanum, *L.* Europe.
lybicum, *Coss.* N. Africa.
maritimum, *Lam.* Europe.
minimum, *Willd.* Europe, &c.
montanum, *L.* Europe, Orient.
podolicum, *Bess.* Europe, &c.
pyrenaicum, *Lapeyr.* Pyrenees.
saxatile, *L.* Europe.

Amaranthus caudatus, *L.* Tropics of Old World.
chlorostachys, *Willd.* Asia, &c.
hypochondriacus, *L.* N. America.
retroflexus, *L.* N. America.
speciosus, *Sims.* India, &c.
viridis, *L.* Tropical regions.

Ambrosia trifida, *L.* N. America.

Amethystea caerulea, *L.* Siberia.

Ammophila arundinacea, *Host.* Europe and N. America.

Amsinckia intermedia, *Fisch. & Mey.* California.

Amsonia Tabernaemontana, *Walt.* N. America.

Anacyclus clavatus, *Pers.* Mediterranean region.
radiatus, *Loisel.* Mediterranean region.

Anagallis arvensis, *L.* Europe, &c.
— var. carnea, (*Schrank*).
— var. caerulea, (*Schreb.*).

Anchusa italica, *Retz.* Mediterranean region.
officinalis, *L.* Europe.

Androsace filiformis, *Retz.* N. Asia, N. America.
lactiflora, *Fisch.* Siberia.
maxima, *L.* Europe, &c.
nana, *Horn.* Europe.

Andryala integrifolia, *L.* Mediterranean region.

Anemone albana, *Stev.* N. Asia, &c.
baldensis, *L.* Europe.
coronaria, *L.* Mediterranean region, &c.
decapetala, *L.* N. America.
multifida, *Poir.* N. America.
pratensis, *L.* Europe.
Pulsatilla, *L.* Europe.
rivularis, *Buch-Ham.* Himalaya.
sylvestris, *L.* Europe.

Angelica dahurica, *Maxim.* E. Asia.

Anoda hastata, *Cav.* Mexico.
Wrightii, *Gray.* Mexico.

Antennaria dioica, *Gaertn.* Europe, &c.
— var. tomentosa, *Hort.*

Anthemis aetnensis, *Schouw.* Mt. Etna.
Bourgei, *Boiss. & Reut.* Spain.
maritima, *L.* Mediterranean region.
montana, *L.* Europe, &c.
nobilis, *L.* Europe.
— var. discoidalis, *Hort.*
peregrina, *L.* Mediterranean region.
tinctoria, *L.* Europe.
Triumfetti, DC. Europe.

Anthericum Liliago, *L.* S. Europe, N. Africa.
— var. algeriense, *B. & R.*
ramosum, *L.* Europe.

Anthoxanthum odoratum, *L.* Europe, N. Asia.
Puelii, *Lecoq & Lamotte.* Europe, &c.

Anthriscus Cerefolium, *Hoffm.* Europe, Asia.

Anthyllis tetraphylla, *L.* Mediterranean region.
Vulneraria, *L.* Europe, &c.

Antirrhinum Asarina, *L.* Italy.
majus, *L.* Mediterranean region.
nuttallianum, *Benth.* California.
Orontium, *L.* Europe.
rupestre, *Boiss. & Reut.* Spain.
tortuosum, *Bosc.* W. Mediterranean region.

Apera interrupta, *Beauv.* Europe, &c.

Apium graveolens, *L.* Europe, &c.

Aquilegia chrysantha, *Gray.* New Mexico.
flavescens, *S. Wats.* California.
vulgaris, *L.* Europe.

Arabis albida, *Stev.* Mediterranean region, &c.
alpestris, *Schleich.* Europe.
alpina, *L.* Europe, N. America.
bellidifolia, *L.* Europe.
blepharophylla, *Hook. & Arn.* California.
cebennensis, *DC.* S. France.
Holboellii, *Hornem.* N. America.
muralis, *Bert.* var. rosea, *DC.* Europe.
petraea, *Lam.* N. temperate regions.
pumila, *Jacq.* Alps, &c.
Soyeri, *Reut. & Huet.* Pyrenees.
Stelleri, *DC.* var. japonica. Japan.
stricta, *Huds.* Europe, &c.
Turczaninowii, *Ledeb.* Siberia.

Archangelica officinalis, *Hoffm.* Europe, &c.

Arctium majus, *Bernh.* Europe.
— var. Kotschyi, *Hort.*
minus, *Bernh.* Europe.
nemorosum, *Lejeune.* Europe.

Arenaria fasciculata, *Gouan.* Europe.
gothica, *Fries.* Europe.

Arenaria—*cont.*
graminifolia, *Schrad.* E. Europe, N. Asia.
— var. multiflora.
— var. parviflora.
grandiflora, *L.* Europe.
gypsophiloides, *L.* Asia Minor, &c.
hirta, *Wormsk.* N. Europe.
laricifolia, *L.* Europe.
pinifolia, *Bieb.* Caucasus.
purpurascens, *Ramond.* Pyrenees.

Argemone mexicana, *L.* Mexico.
platyceras, *Link & Otto.* Mexico.

Armeria latifolia, *Willd.* Portugal.
maritima, *Willd.* Europe.
— var. alba.
plantaginea, *Willd.* Europe.
pungens, *Hoffmgg. & Link.* Portugal, &c.

Arnica amplexicaulis, *Nutt.* N. W. America.
montana, *L.* Europe, N. Asia.

Arrhenatherum avenaceum, *Beauv.* Europe.

Artemisia annua, *L.* E. Europe, N. Asia.

Arum italicum, *Mill.* Europe.
maculatum, *L.* Europe.

Asparagus officinalis, *L.* Europe, &c.

Asperella hystrix, *Willd.* N. America.

Asperula azurea, *Jaub. & Spach.* Syria.
galioides, *Bieb.* Europe, &c.
tinctoria, *L.* Europe.

Asphodeline liburnica, *Reichb.* S. E. Europe.

Asphodelus albus, *Willd.* S. Europe.
fistulosus, *L.* Mediterranean region.

Aster acuminatus, *Michx.* N. America.
alpinus, *L.* Europe, N. Asia.
Amellus, *L.* Europe, &c.
corymbosus, *Ait.* N. America.
Curtisii, *Gray.* N. America.
dahuricus, *Benth.* Siberia.
diplostephioides, *Benth. & Hook. f.* Himalaya.

Aster—*cont.*
puniceus, *L.* N. America.
— var. lucidulus, Gray.
pyrenaeus, *DC.* Pyrenees.
Radula, *Ait.* N. America.
scaber, *Thunb.* Japan.
tanacetifolius, *H. B. & K.* California, &c.
tricephalus, *C. B. Clarke.* Himalaya.
umbellatus, *Mill.* N. America.

Astragalus alpinus, *L.* N. and Arctic regions.
boeticus, *L.* Mediterranean region.
chinensis, *L.* China.
chlorostachys, *Lindl.* Himalaya.
Cicer, *L.* S. Europe.
frigidus, *Gray.* N. America.
glycyphyllus, *L.* Europe, &c.
kahiricus, *DC.* Orient.
oroboides, *Hornem.* N. Europe, N. America.
scorpioides, *Pourr.* Spain.

Astrantia Biebersteinii, *Fisch. & Mey.* Caucacus.
major, *L.* Europe, &c.
— var. carinthiaca, (Hoppe).
minor, *L.* Europe.

Athamanta cretensis, *L.* S. Europe.

Atriplex Babingtonii, *Woods.* Europe.
hortensis, *L.* N. Asia.
— var. rubra, Hort.
sibirica, *L.* Siberia.

Atropa Belladonna, *L.* Europe, &c.

Aubrietia deltoidea, *DC.* S. Europe.
— var. graeca, (*Griseb.*).
— var. grandiflora.
— var. Leichtlinii, *Hort.*
— var. Richardi, *Hort.*
erubescens, *Griseb.* Greece.
gracilis, *Sprun.* Greece.

Avena brevis, *Roth.* Europe.
pratensis, *L.* Europe, Siberia.
pubescens, *Huds.* Europe, &c.
sativa, *L.* Cultivated.
strigosa, *Schreb.* Europe, &c.

Baeria gracilis, *Gray.* W. California.
platycarpha, *Gray.* California.

Baptisia australis, *R. Br.* N. America.

Barbarea intermedia, *Bor.* Europe.
praecox, *R.Br.* Europe.
vulgaris, *R. Br.* Europe, Temp. Asia.
— var. variegata.

Beckmannia erucaeformis, *Host.* N. hemisphere.
— var. uniflorus, *Scrib.* N. Amer.

Beta trigyna, *Waldst. & Kit.* E. Europe, Asia Minor.
vulgaris, *L.* Europe, Africa, &c.

Bidens frondosa, *L.* N. America.
grandiflora, *Balb.* Mexico.
humilis, *H. B. K.* S. America.
leucantha, *Willd.* West Indies, &c.

Biscutella ciliata, *DC.* S. Europe.
didyma, *L.* Mediterranean region.
— var. apula, *L.* Europe.

Blumenbachia insignis, *Schrad.* Monte Video.

Bocconia cordata, *Willd.* China & Japan.
microcarpa, *Maxim.* N China.

Boltonia asteroides, *L'Herit.* N America.
incisa, *Benth.* Siberia.

Borago officinalis, *L.* Europe, Asia Minor.

Boykinia major, *Gray.* California.

Brachyactis robusta, *Benth.* Himalaya.

Brachycome iberidifolia, *Benth.* Australia.

Brachypodium distachyum, *Beauv.* Europe, &c.

Brassica balearica, *P.* Balearic Islands.
campestris, *L.* Old World.
— var. chinensis, (*L.*)
Erucastrum, *L.* Europe.
juncea, *Coss.* Temperate and tropical Asia.
nigra, *Koch.* Old World.

Brassica—*cont.*
oleracea, *L.* Europe.
Tournefortii, *Gouan.* Mediterranean region.

Briza maxima, *L.* Mediterranean region.
media, *L.* Europe, &c.
minor, *L.* Europe, &c.

Brodiaea congesta, *Sm.* N. W. America.
grandiflora, *Sm.* N. W. America.

Bromus adoënsis, *Hochst.* Abyssinia.
albidus, *Bieb.* Caucasus.
asper, *Murr.* Europe, &c.
breviaristatus, *Buckl.* N. W. America.
ciliatus, *L.* N. America.
erectus, *Huds.* Europe, &c.
inermis, *Leyss.* Europe, &c.
Kalmii, *Gray.* N. America.
macrostachys, *Desf.* Mediterranean region.
madritensis, *L.* Europe, &c.
maximus, *Desf.* Europe, &c.
— var. Gussonei (*Parl.*).
mollis, *L.* Europe, &c.
propendens, *Jord.* Europe.
racemosus, *L.* Europe.
sterilis, *L.* Europe, &c.
Tacna, *Steud.* Peru.
tectorum, *L.* Europe, Asia.
unioloides, *H. B. & K.* South America.

Browallia demissa, *L.* Peru, &c.
elata, *L.* Peru.

Bryonia dioica, *Jacq.* Europe.

Bulbine annua, *Willd.* Cape of Good Hope.

Bulbinella Hookeri, *Benth. & Hook. f.* N. Zealand.

Buphthalmum speciosum, *Schreb.* Europe.

Bupleurum Candollei, *Wall.* Himalaya.
longifolium, *L.* Europe.
rigidum, *L.* W. Europe.
rotundifolium, *L.* Europe, &c.

Butomus umbellatus, *L.* Europe, &c.

Calamagrostis epigeios, *Roth.* Europe, &c.
varia, *Beauv.* Europe, &c.

Calamintha Acinos, *Clairv.* Europe, &c.
Clinopodium, *Benth.* N. temperate regions.
grandiflora, *Moench.* Europe.
officinalis, *Moench.* var. umbrosa, *Reichb.* Europe.
patavina, *Host.* Europe, &c.

Calandrinia grandiflora, *Lindl.* Chili.
Menziesii, *Torr. & Gray.* N. W. America.
pilosiuscula, *DC.* Chili.
umbellata, *DC.* Chili.

Calceolaria mexicana, *Benth.* Mexico.

Calendula officinalis, *L.* S. Europe.
suffruticosa, *Vahl.* W. Mediterranean region.

Callirhöe digitata, *Nutt* N. W. America.
involucrata, *Gray.* N. America.

Caltha palustris, *L.* N. hemisphere.
— var. minor, *Syme.*

Camassia Cusickii, *S. Wats.* California.
esculenta, *Lindl.* N. W. America.
Fraseri, *Torr.* N. America.
Leichtlinii, *S. Wats.* California.

Camelina sativa, *Crantz.* Europe, &c.

Campanula alliariaefolia, *Willd.* Caucasus, &c.
barbata, *L.* Europe.
bononiensis, *L.* Europe.
carpatica, *Jacq.* E. Europe.
collina, *Bieb.* Caucasus.
drabaefolia, *Sibth. & Sm.* Greece.
— var. alba.
Erinus, *L.* Mediterranean region.
excisa, *Schleich.* Switzerland.
glomerata, *L.* Europe, &c.
— var. dahurica.

Campanula—*cont.*
lactiflora, *Bieb.* Caucasus.
latifolia, *L.* Europe, &c.
— var. macrantha, (Fisch.).
— var. versicolor, (*Sibth. & Sm.*).
latiloba, *DC.* Olympus.
Medium, *L.* S. Europe.
persicifolia, *L.* Europe, &c.
— var. alba.
— var. maxima.
pulla, *L.* Europe.
pyramidalis, *L.* Europe.
ramosissima, *Sibth. & Sm.* Greece.
rapunculoides, *L.* Europe, &c.
reuteriana, *Boiss. & Bal.* Asia Minor, &c.
rhomboidalis, *L.* Europe.
rotundifolia, *L.* N. temperate regions.
Scheuchzeri, *Vill.* Europe.
sibirica, *L.* Europe, Asia.
spicata, *L.* Europe.
subpyrenaica, *Timb.* Europe.
thyrsoides, *L.* Europe.
Trachelium, *L.* Europe, &c.

Cannabis sativa, *L.* Central Asia.

Carbenia benedicta, *Adans.* Mediterrean region, &c.

Cardamine graeca, *L.* E. Mediterranean region.
impatiens, *L.* Europe, &c.

Carduus crispus, *L.* Europe, &c.
nutans, *L.* Europe, &c.
orthocephalus, *Wallr.* Europe.
stenolepis, *Benth.* Central Asia.
tenuiflorus, *Curt.* Europe, &c.

Carex adusta, *Boott.* N. America.
depauperata, *Good.* Europe, &c.
divulsa, *Good.* N. temperate regions.
flava, *L.* N. temperate regions.
fusca, *All.* Europe, &c.
hirta, *L.* Europe, &c.
hordeistichos, *Vill.* Europe, &c.
leporina, *L.* N. temperate regions.
paniculata, *L.* Temperate regions.
pendula, *Huds.* Europe, &c.
sylvatica, *Huds.* Europe, &c.

Carex—*cont.*
tribuloides, *Wahlenb.* N. America.
vulpina, *L.* Europe, &c.

Carrichtera Vellae, *DC.* S. Europe.

Carthamus lanatus, *L.* Europe, &c.
tinctorius, *L.* Europe, &c.

Carum Bulbocastanum, *Koch.* Europe, &c.
Carvi, *L.* Europe, &c.
copticum, *Benth. & Hook. f.* Europe, &c.
Petroselinum, *Benth. & Hook. f.* Old World.
rigidulum, *Koch.* Europe.

Catananche caerulea, *L.* W. Mediterranean region.
lutea, *L.* Mediterranean region.

Cathcartia villosa, *Hook. f.* Himalaya.

Caucalis daucoides, *L.* Europe, &c.

Celsia orientalis, *L.* Asia Minor.
pontica, *Boiss.* Asia Minor.

Cenchrus echinatus, *L.* Tropics.
tribuloides, *L.* N. America.

Cenia turbinata, *Pers.* Cape of Good Hope.

Centaurea alba, *L.* var. deusta, *Ten.* S. Europe.
atropurpurea, *Waldst. & Kit.* E. Europe.
axillaris, *Willd.* Europe, &c.
Crocodylium, *L.* Syria.
Cyanus, *L.* Europe, &c.
cynaroides, *Link.* Canary Islands.
dealbata, *Willd.* Asia Minor, &c.
gymnocarpa, *Moris.* Island of Capra.
Jacea, *L.* Europe, &c.
melitensis, *L.* Europe.
nigra, *L.* Europe.
nigrescens, *Willd.* Europe.
— var. vochinensis (*Bernh.*).
pulchra, *DC.* India.
Scabiosa, *L.* Europe.
— var. olivieriana, (*DC.*).

Centranthus Calcitrapa, *Dufr.* Europe.
macrosiphon, *Boiss.* Spain.
ruber, *DC.* Europe, &c.

Cephalaria alpina, *Schrad.* Europe.
syriaca, *Schrad.* Mediterranean region.
tatarica, *Schrad.* Siberia.
transsylvanica, *L.* South Europe, Asia Minor, &c.

Cerastium chloraefolium, *Fisch. & Mey.* Asia Minor.
perfoliatum, *L.* Mediterranean region.
purpurascens, *Adams.* Asia Minor, &c.

Cerinthe alpina, *Kit.* Europe, &c.
aspera, *Roth.* Europe.
major, *L.* Europe.

Chaerophyllum aromaticum, *L.* Europe.
aureum, *L.* Europe, Asia Minor.

Charieis heterophylla, *Cass.* Cape of Good Hope.
— var. rubra.

Chelidonium majus, *L.* Europe, &c.
— var. flore pleno.
— var. laciniatum.

Chelone Lyoni, *Pursh.* N. America.
nemorosa, *Dougl.* N. America.
obliqua, *L.* N. America.

Chenopodium album, *L.* Temperate and tropical regions.
ambrosoides, *L.* Temperate and tropical regions.
aromaticum, *Hort.* Origin uncertain.
Bonus-Henricus, *L.* Europe.
Botrys, *L.* Europe, &c.
capitatum, *Aschers.* Europe, &c.
ficifolium, *Sm.* Europe.
graveolens, *Willd.* Mexico.
opulifolium, *Schrad.* Europe, &c.
virgatum, *Thumb.* Japan.
Vulvaria, *L.* Europe, &c.

Chionodoxa Luciliae, *Boiss.* Asia Minor.

Chloris submutica, *H. B. & K.* Mexico.

Chlorogalum pomeridianum, *Kunth.* California.

Chorispora tenella, *DC.* Caucasus, &c.

Chrysanthemum Balsamita, *L.* W. Asia.
carinatum, *Schousb.* N. Africa.
— var. atrococcineum.
carneum, *Steud.* Caucasus.
caucasicum, *Pers.* Caucasus.
cinerariaefolium, *Vis.* Dalmatia.
coronarium, *L.* Mediterranean region.
Leucanthemum, *L.* Europe, &c.
maximum, *Ramond.* Pyrenees.
macrophyllum, *Waldst. & Kit.* Hungary.
multicaule, *Desf.* N. Africa.
Parthenium, *Bernh.* Europe.
praealtum, *Vent.* Caucasus, &c.
segetum, *L.* Europe, &c.
setabense, *Dufour.* Spain & Portugal.

Cicer arietinum, *L.* Europe, &c.

Cichorium Endivia, *L.* Orient.
Intybus, *L.* Europe.

Cimicifuga foetida, *L.* Europe, &c.
— var. intermedia.
racemosa, *Nutt.* N. America.

Cladium germanicum, *Schrad.* Temperate & subtropical regions.

Clarkia elegans, *Dougl.* California.
pulchella, *Pursh.* Oregon, &c.
— var. alba.

Claytonia perfoliata, *Donn.* N. America.

Clematis integrifolia, *L.* S. Europe, &c.
ochroleuca, *Ait.* N. America.
recta, *L.* S. Europe.

Cleome integrifolia, *Torr. & Gray.* N. America.
violacea, *L.* Europe, &c.

Cleonia lusitanica, *L.* Spain, &c.

Clypeola cyclodontea, *Delile.* Europe.

Cnicus altissimus, *Willd.* N. America.
arachnoideus, *Bieb.* Caucasus.
canus, *Roth.* Europe.
ciliatus, *Roth.* Europe.
fimbriatus, *Bieb.* Caucasus.
horridus, *Bieb.* Caucasus.

Cnicus—*cont.*
intermedius, *Heller.* Europe.
lanceolatus, *Willd.* Europe.
ligularis, *Hort. Kew.* Orient.
monspessulanus, *L.* S. Europe.
ochroleucus, *Spreng.* Europe.
oleraceus, *L.* Europe.
serrulatus, *Bieb.* Europe, Caucasus.
stellatus, *Roth.* Europe.
syriacus, *Roth.* Mediterranean region.

Cochlearia danica, *L.* N. & Arctic regions.
glastifolia, *L.* S. Europe.
officinalis, *L.* N. & Arctic regions.

Codonopsis ovata, *Benth.* W. Himalaya.

Colchicum speciosum, *Stev.* Caucasus.

Collinsia bartsiaefolia, *Benth.* California.
bicolor, *Benth.* California.
— var. multicolor.
grandiflora, *Dougl.* N. W. America.
parviflora, *Lindl.* N. America.
sparsiflora, *Fisch. & Mey.* N. America.

Collomia coccinea, *Lehm.* Chili.
gilioides, *Benth.* California.
grandiflora, *Dougl.* California.
linearis, *Nutt.* California, &c.

Commelina coelestis, *Willd.* Mexico.
Hasskarlii, *C.B. Clarke.* E. Indies.

Conium maculatum, *L.* Europe.

Conringia orientalis, *Dum.* Europe, &c.

Convallaria majalis, *L.* N. temperate regions.

Convolvulus tricolor, *L.* Mediterranean region.
— var. alba.
undulatus, *Cav.* Mediterranean region.

Coreopsis abyssinica, *Sch. Bip.* Abyssinia.
atkinsoniana, *Dougl.* N. W. America.

Coreopsis—*cont.*
Drummondi, *Torr. & Gray.* Texas.
grandiflora, *Nutt.* S. United States.
lanceolata, *L.* N. America.
— var. villosa. *Michx.* S. United States.
tinctoria, *Nutt.* N. America.
— var. atrosanguinea.

Coriandrum sativum, *L.* Europe, &c.

Corispermum hyssopifolium, *L.* N. hemisphere.

Coronilla atlantica, *Boiss. & Reut.* Marocco.
vaginalis, *Lam.* Europe, &c.
varia, *L.* Europe, &c.

Cortusa Matthioli, *L.* Europe & N. Asia.
— var. grandiflora.

Corydalis capnoides, *Wahlenb.* Europe.
glauca, *Pursh.* N. America.
racemosa, *Pers.* Japan.
sibirica, *Pers.* Siberia.

Corynephorus canescens, *Beauv.* Europe.

Cosmos bipinnatus, *Cav.* Mexico, &c.

Cotula coronopifolia, *L.* S. Africa.

Crambe pinnatifida, *R. Br.* Caucacus.

Crepis alpina, *L.* Asia Minor, &c.
grandiflora, *Tausch.* Europe.
hyoseridifolia, *Reichb.* Europe.
rubra, *L.* S. Europe, &c.
setosa, *Hall. f.* Europe, &c.
tectorum, *L.* Europe, &c.
virens, *L.* Europe, &c.

Crocus biflorus, *Mill.* Tuscany, &c.
etruscus, *Parl.* Tuscany.
Imperati, *Tenore.* Southern Italy.
iridiflorus, *Heuff.* E. Europe.
medius, *Balb.* N. Italy.
pulchellus, *Herb.* E. Europe, Asia Minor.
reticulatus, *Bieb.* E. Europe.
sativus, *L.* Europe, W. Asia.
— var. cartwrightianus, *Maw.*

Crocus—*cont.*
Sieberi, *Gay.* Greece, &c.
speciosus, *Bieb.* Asia Minor.
tommasinianus, *Herb.* Dalmatia, &c.
vernus, *All.* Europe.
versicolor, *Ker-Gawl.* S. France, Italy.
zonatus, *Gay.* Asia Minor.

Crucianella aegyptiaca, *L.* Egypt.

Cucubalus bacciferus, *L.* Europe, &c.

Cuminum Cyminum, *L.* Mediterranean region.

Cuphea lanceolata, *Ait.* Mexico.
pinetorum, *Benth.* Mexico.
viscosissima, *Jacq.* N. America.
Zimapani, *Morr.* Mexico.

Cuscuta Epilinum, *Weihe.* Europe, &c.

Cynara Scolymus, *L.* Europe, &c.

Cynodon Dactylon, *Pers.* Cosmopolitan.

Cynoglossum officinale, *L.* Europe, &c.
pictum, *Ait.* Mediterranean region.

Cynosurus cristatus, *L.* Europe, &c.
echinatus, *L.* S. Europe, &c.

Dactylis glomerata, *L.* Europe, &c.

Dahlia coccinea, *Cav.* Mexico.
scapigera, *Knowles & Westcott.* Mexico.
variabilis, *Desf.* Mexico.

Dalea Lagopus, *Willd.* Mexico.

Datura Stramonium, *L.* Cosmopolitan.
Tatula, *L.* Europe, &c.
— var. gigantea.

Daucus Carota, *L.* Europe, &c.
pusillus, *Michx.* N. America.

Delphinium Ajacis, *Reichb.* Europe.
brunonianum, *Royle.* Himalaya.
cardiopetalum, *DC.* Europe.
caucasicum, *C. A. Mey.* Caucasus.
Consolida, *L.* Europe, &c.

Delphinium—*cont.*
corymbosum, *Regel.* Turkestan.
dictyocarpum, *DC.* Siberia.
elatum, *L.* Europe, &c.
— var. alpinum, (*Waldst. & Kit.*)
— var. intermedium.
formosum, *Boiss. & Huet.* Armenia.
grandiflorum, *L.* Siberia.
hybridum, *Steph.* Europe & Orient.
maackianum, *Regel.* Amurland.
orientale, *J. Gay.* Europe, Orient.
speciosum, *Bieb.* Caucasus.
— var. turkestanicum.
taliense, *Franch.* China.
triste, *Fisch.* Siberia.
trolliifolium, *Gray.* N. W. America.
vestitum, *Wall.* Himalaya.

Demazeria sicula, *Dum.* Europe.

Deschampsia caespitosa, *Beauv.* Temperate regions.
flexuosa, *Trin.* N. temperate regions.

Deyeuxia neglecta, *Kunth.* N. temperate regions.

Dianthus arenarius, *L.* Europe.
atrorubens, *All.* S. Europe.
caesius, *Sm.* Europe.
callizonus, *Schott & Kotschy.* Transylvania.
Caryophyllus, *L.* Europe, &c.
ciliatus, *Guss.* Italy, &c.
deltoides, *L.* Europe, &c.
fragrans, *Bieb.* Caucasus.
hirtus, *Vill.* France.
intermedius, *Boiss.* var. ambiguus, *Panc.* Servia.
longicaulis, *Tenore.* Italy.
monspessulanus, *L.* S. Europe.
petraeus, *Waldst. & Kit.* E. Europe.
plumarius, *L.* Europe, &c.
pubescens, *Sibth. & Sm.* Greece, &c.
Requienii, *Gren. & Godr.* Pyrenees.
squarrosus, *Bieb.* Crimea, &c.

Dianthus—*cont.*
superbus, *L.* Europe, &c.
tener, *Balb.* Piedmont.
tymphresteus, *Heldr. & Sart.* Greece.

Dictamnus albus, *L.* Europe, &c.
— var. purpureus.

Digitalis ambigua, *Murr.* Europe, &c.
ferruginea, *L.* Europe.
lutea, *L.* Europe.
media, *Roth.* S. Europe.
purpurea, *L.* Europe.
— var. alba, *Hort.*

Dimorphotheca annua, *Less.* Cape of Good Hope.
hybrida, *DC.* Cape of Good Hope.

Dipcadi serotinum, *Medic.* Europe, &c.

Diplotaxis tenuifolia, *DC.* Europe, &c.

Dipsacus asper, *Wall.* Himalaya.
fullonum, *L.* Europe, &c.
laciniatus, *L.* Europe, &c.
sylvestris, *Mill.* Europe, &c.

Dischisma arenarium, *E. Mey.* Cape of Good Hope.

Disporum Hookerii, *Nichols.* California.

Dodecatheon Meadia, *L.* N. America.
— var. macrocarpum, *Gray.*

Dorycnium herbaceum, *Vill.* S. Europe, Asia Minor.

Draba aizoides, *L.* Europe.
arabisans, *Michx.* N. America.
carinthiaca, *Hoppe.* Europe.
frigida, *Saut.* Alps, Europe.
incana, *L.* N. arctic regions.
— var. Thomasii, (*Koch*).
Kotschyi, *Stur.* E. Europe.
lactea, *Adams.* Europe.
Loiseleurii, *Boiss.* Corsica.
stellata, *Jacq.* N. and arctic regions.

Dracocephalum grandiflorum, *L.* Siberia.
Moldavica, *L.* Siberia, &c.

Dracocephalum—*cont.*
nutans, *L.* Siberia.
parviflorum, *Nutt.* N. America.
ruyschiana, *L.* Europe, &c.

Drimia robusta, *Baker.* S. Africa.

Dryas octopetala, *L.* Europe, &c.

Ecballium Elaterium, *A. Rich.* Mediterranean region.

Eccremocarpus scaber, *Ruiz & Par.* Chili.

Echinops globifer, *Janka.* E. Europe.
sphaerocephalus, *L.* Europe, &c.

Echium plantagineum, *L.* Europe, &c.

Eleusine coracana, *Gaertn.* S. America, &c.
oligostachya, *Link.* Brazil.

Elsholtzia cristata, *Willd.* Europe, N. Asia.

Elymus canadensis, *L.* N. America.
— var. glaucifolius, *Gray.*
sibiricus, *L.* Siberia.
virginicus, *L.* N. America.

Emex spinosa, *Campd.* S. Europe, &c.

Emilia flammea, *Cass.* India, &c.

Encelia subaristata, *Gray.* Mexico.

Epilobium alsinifolium, *Vill.* Europe.
angustifolium, *L.* N. hemisphere.
— var. album.
billardierianum, *Ser.* Australia.
Dodonaei, *Vill.* Europe.
hirsutum, *L.* Europe.
Lamyi, *Schultz.* S. Europe, &c.
linnaeoides, *Hook. f.* N. Zealand, &c.
montanum, *L.* Europe.
nummularifolium, *A. Cunn.* N. Zealand.
— var. longipes.
— var. pedunculare, *Cunn.*
parviflorum, *Schreb.* Europe, &c.
roseum, *Schreb.* Europe, &c.

Epilobium—*cont.*
rosmarinifolium, *Haenke*. Europe.
— var. sericeum.
tetragonum, *L.* Europe.
trigonum, *Schrank*. Europe.

Eragrostis Brownei, *Nees*. Tropics, &c.
minor, *Host*. Tropics.

Eremostachys laciniata, *Bunge*. Asia Minor, &c.

Eremurus altaicus, *Stev*. Siberia, &c.
kaufmanniana, *Regel*. Turkestan.
spectabilis, *Bieb*. Asia Minor, &c.

Erigeron acre, *L.* var. angustatus, (*Fries*).
droebachensis, *O. Muell*. Europe.
glabellus, *Nutt*. N. America.
— var. asper.
speciosus, *DC*.N.W.America.
strigosus, *Muhl*. N. America.

Erinus alpinus, *L.* Europe.
— var. albus.

Eriophyllum caespitosum, *Dougl*. N.W. America.

Eritrichium strictum, *Decne*. Himalaya.

Erodium guttatum, *Willd*. W. Mediterranean region.
hymenodes, *L'Herit*. Algeria.
macradenium, *L'Herit*. Pyrenees.
moschatum, *L'Herit*. Europe, &c.
serotinum, *Stev*. Caucasus.
trichomanefolium, *L'Herit*. Spain.
tmoleum, *Reut*. Asia Minor.

Eruca sativa, *Mill*. Mediterranean region.

Eryngium giganteum, *Bieb*. Armenia.
oliverianum, *Delar*. Orient.
planum, *L.* Europe, &c.
triquetrum, *Vahl*. N. Africa.

Erysimum asperum, *DC*. N. America.
aureum, *Bieb*. Caucasus.
boryanum, *Boiss*. Greece, &c.
hieracifolium, *L.* Europe.
marshallianum, *Andrz*. Siberia, &c.
perowskianum, *Fisch. & Mey*. Caucasus.

Erythraea Centaurium, *Pers*. Europe.

Eschscholzia californica, *Cham*. California.
— var. alba.
— var. caespitosa, *Brewer*.

Eucharidium concinnum, *Fisch. & Mey*. California.
— var. grandiflorum.

Eupatorium ageratoides, *L.* N. America.
cannabinum, *L.* Europe, &c.
serotinum, *Michx*. N. America.

Euphorbia Bornmülleri, *Haussk*. Orient.
coralloides, *L.* S. Europe.
exigua, *L.* Europe.
flavicoma, *DC*. Spain, &c.
hierosolymitana, *Boiss*. Syria.
Myrsinites, *L.* S. Europe.
Peplis, *L.* Europe, &c.
platyphyllos, *L.* Europe, &c.
Preslii, *Guss*. N. America.
segetalis, *L.* Europe.
stricta, *L.* Europe.
virgata, *Waldst. & Kit*. E. Europe.

Fagopyrum esculentum, *Moench*. Europe, &c.
tataricum, *Gaertn*. Europe, &c.

Farsetia clypeata, *R. Br*. S. Europe, &c.

Fedia Cornucopiae, *Gaertn*. Mediterranean region.

Felicia fragilis, *Cass*. S. Africa.

Ferula communis, *L.* Mediterranean region.
Ferulago, *L.* S. Europe, &c.
glauca, *L.* S. Europe.
— var. candelabra, *Heldr*.
Linki, *Webb. & Berth*. Canary Islands.
tingitana, *L.* N. Africa, &c.

Festuca ampla, *Hack.* Spain.
capillifolia, *Dufour.* Spain.
delicatula, *Lag.* Spain and Portugal.
duriuscula, *L.* Europe, &c.
— var. crassifolia, *Gaud.*
elatior, *L.* Europe, &c.
— var. pratensis, (*Huds.*)
gigantea, *Vill.* Europe, &c.
Halleri, *All.* S. Europe.
heterophylla, *Lam.* Europe.
Myuros, *L.* Europe, &c.
pančičiana, *Hack.* Europe.
Poa, *Kunth.* S. Europe.
rigida, *Kunth.* S. Europe.
sciuroides, *Roth.* Europe.
scoparia, *Kern.* Pyrenees.

Foeniculum vulgare, *Mill.* Europe.

Fragaria indica, *Andr.* India, China, &c.

Fritillaria armena, *Boiss.* Asia Minor.
imperialis, *L.* Orient.
Meleagris, *L.* Europe, &c.
— var. alba.
pontica, *Wahl.* Asia Minor.

Funkia lancifolia, *Spreng.* Japan.
— var. albo-marginata, *Hort.*
ovata, *Spreng.* Japan.
sieboldiana, *Hook.* Japan.

Galega officinalis, *L.* Europe, &c.
orientalis, *Lam.* Caucasus.

Galinsoga brachystephana, *Regel.* S. America.
parviflora, *Cav.* S. America.

Galium boreale, *L.* N. temperate regions.
Mollugo, *L.* Europe, &c.
recurvum, *Req.* Greece, &c.
tenuissimum, *Bieb.* Caucasus.
tricorne, *Stokes.* Europe, &c.
uliginosum, *L.* Europe, &c.
verum, *L.* Europe, &c.

Gaudinia fragilis, *Beauv.* Mediterranean region.

Gaura parviflora, *Dougl.* N. America.
villosa, *Torr.* N. America.

Gentiana asclepiadea, *L.* Europe.
— var. alba.
cruciata, *L.* Europe, &c.

Gentiana—*cont.*
lutea, *L.* Europe, &c.
septemfida, *Pall.* Caucasus.
tibetica, *King.* Himalaya, &c.

Geranium albanum, *Bieb.* Caucasus.
armenum, *Boiss.* Orient.
bohemicum, *L.* Europe.
Endressi, *Gay.* Pyrenees.
eriostemon, *Fisch.* Siberia.
Londesii, *Fisch.* Siberia.
lucidum, *L.* Europe, &c.
nodosum, *L.* Europe.
palustre, *L.* Europe, &c.
pratense, *L.* Europe, &c.
— var. alba.
pusillum, *Burm. f.* Europe, &c.
rivulare, *Vill.* Europe.
sylvaticum, *L.* Europe, &c.
wallichianum, *G. Don.* Himalaya.
Wilfordi, *Maxim.* Manchuria.
wlassovianum, *Fisch.* Siberia.

Gerbera Bellidiastrum, *Benth.* China, &c.

Geum chiloense, *Balb.* Chili.
hispidum, *Fries.* Spain.
inclinatum, *Schleich.* Switzerland.
macrophyllum, *Willd.* N. W. America.
molle, *Vis.* Servia.
montanum, *L.* Europe.
pyrenaicum, *Mill.* Pyrenees.
rivale, *L.* N. temperate regions.
strictum, *Ait.* N. temperate regions.
triflorum, *Pursh.* N. America.
tyrolense, *Kern.* Tyrol.
urbanum, *L.* Europe, &c.

Gilia achilleaefolia, *Benth.* California.
androsacea, *Steud.* California.
— var. rosea.
capitata, *Sims.* N.W. America.
inconspicua, *Dougl.* California.
laciniata, *Ruiz & Pav.* Chili, Peru.
micrantha, *Steud.* California.
squarrosa, *Hook. & Arn.* California.
tricolor, *Benth.* California.
— var. alba.

Gillenia trifoliata, *Moench.* N. America.

Gladiolus segetum, *Ker-Gawl.* Mediterranean region.

Glaucium corniculatum, *Curt.* Europe, &c.
— var. rubrum, *Hort.*
flavum, *Crantz.* var. fulvum, Sm.

Globularia tricosantha, *Fisch. & Mey.* Asia Minor, &c.

Glyceria maritima, *Mert. & Koch.* N. temperate regions.
remota, *Fries.* N. Europe.

Glycine Soja, *Sieb. & Zucc.* Tropical Asia.

Gnaphalium indicum, *L.* Tropics of Old World.
luteo-album, *L.* Cosmopolitan.

Gratiola officinalis, *L.* Europe.
— var. minor.

Grindelia glutinosa, *Dunal.* California.
squarrosa, *Dunal.* N. W. America.

Gunnera chilensis, *Lam.* Chili.

Gypsophila cerastoides, *D. Don.* Himalaya.
muralis, *L.* Europe.
paniculata, *L.* Siberia, &c.
Rokejeka, *Delile.* Egypt, &c.

Hablitzia tamnoides, *Bieb.* Caucasus.

Halenia elliptica, *D. Don.* Himalaya region.

Hastingia alba, *S. Wats.* California.

Hebenstreitia comosa, *Hochst.* Cape of Good Hope.
dentata, *L.* Cape of Good Hope, &c.
tenuifolia, *Schrad.* Cape of Good Hope.

Hedysarum boreale, *Nutt.* N. America.
coronarium, *L.* S. W. Europe.
flexuosum, *L.* Spain.
microcalyx, *Baker.* Himalaya.
neglectum, *Ledeb.* Siberia.
obscurum, *L.* Europe.
Sibthorpii, *Nym.* Mediterranean region.

Helenium Bolanderi, *Gray.* California.

Helianthus annuus, *L.* N. America.
debilis, *Nutt.* Texas, &c.

Helichrysum bracteatum, *Andr.* Australia.
— var. album.
— var. luteum.
serotinum, *Boiss.* S.W. Europe.

Heliophila amplexicaulis, *L. f.* Cape of Good Hope.
araboides, *Sims.* Cape of Good Hope.
crithmifolia, *Willd.* Cape of Good Hope.

Heliopsis laevis, *Pers.* N. America.

Heliotropium europaeum, *L.* Europe.

Helipterum humboldtianum, *DC.* Australia.
Manglesii, *F. Muell.* Australia.
Milleri, *Hort.* Australia.
roseum, *Benth.* Australia.

Helleborus colchicus, *Regel.* Mingrelia.
foetidus, *L.* Europe.
orientalis, *Lam.* Greece, &c.
— var. roseus.

Helonias bullata, *L.* N. America.
— var. latifolia.

Hemerocallis flava, *L.* S. Europe.
fulva, *L.* S. Europe, &c.
— var. Kwanso, *Regel.*

Heracleum gummiferum, *Willd.* Europe.
lanatum, *Michx.* N. America.
Panaces, *L.* S. Europe.
Sphondylium, *L.* Europe.
villosum, *Fisch.* Caucasus.

Hesperis matronalis, *L.* Europe, &c.

Heuchera Drummondi, *Hort.* Origin uncertain.
glabra, *Willd.* N.W. America.
pilosissima, *Fisch. & Mey.* N. America.
sanguinea, *Engelm.* New Mexico.

Hibiscus Trionum, *L.* Tropics of Old World.

Hieracium alpinum, *L.* Europe.
aurantiacum, *L.* Europe.
Jankae, *Uechtritz.* E. Europe.
lanatum, *Waldst. & Kit.* Europe.
nigrescens, *Willd.* E. Europe.
onosmoides, *Fries.* Norway.
pallidum, *Biv.* Norway.
pratense, *Tausch.* Europe, &c.
rigidum, *Hartm.* Europe.
saxatile, *Vill.* Europe.
stoloniflorum, *Waldst. & Kit.* Europe.
villosum, *Jacq.* Europe.
vulgatum, *Fries.* N. temperate regions.

Hierochloë borealis, *Roem. & Schult.* Northern regions.

Hippocrepis multisiliquosa, *L.* Mediterranean region.

Holcus lanatus, *L.* Europe.

Hordeum jubatum, *L.* N. America, &c.
maritimum, *With.* Europe, &c.
murinum, *L.* Europe, &c.
secalinum, *Schreb.* Europe, &c.

Horminum pyrenaicum, *L.* Pyrenees.

Hunnemannia fumariaefolia, *Sweet.* California.

Hyacinthus amethystinus, *L.* Pyrenees.
romanus, *L.* Mediterranean region, &c.

Hydrophyllum canadense, *L.* N. America.
virginicum, *L.* N. America.

Hymenophysa pubescens, *C. A. Mey.* Siberia.

Hyoscyamus aureus, *L.* Asia Minor, &c.
niger, *L.* Europe, &c.
— var. albus, *Hort.*

Hypecoum grandiflorum, *Benth.* Mediterranean region.
procumbens, *L.* Mediterranean region, &c.

Hypericum atomarium, *Boiss.* Asia Minor, &c.
elodioides, *Choisy.* Himalaya.
humifusum, *L.* Europe.
montanum, *L.* Europe.
orientale, *L.* var. decussatum, (Kunze).
perforatum, *L.* Europe, &c.
Richeri, *Vill.* Europe.
— var. Burseri, *Spach.* Transsylvania.
tetrapterum, *Fries.* Europe, &c.

Hypochoeris glabra, *L.* Europe.

Hyssopus officinalis, *L.* Europe, &c.

Iberis amara, *L.* Europe.
ciliata, *All.* Italy, &c.
lagascana, *DC.* Spain.
pectinata, *Boiss.* Spain.
umbellata, *L.* S. Europe.
— var. carnea.

Impatiens amphorata, *Edgw.* Himalaya.
balsamina, *L.* India & Orient.
bicornuta, *Wall.* Himalaya.
parviflora, *DC.* Siberia, &c.
Roylei, *Walp.* Himalaya.
scabrida, *DC.* Himalaya.

Inula ensifolia, *L.* S. Europe, &c.
glandulosa, *Puschk.* Caucasus.
grandiflora, *Willd.* Himalaya, &c.
Helenium, *L.* Europe, &c.

Iris aurea, *Lindl.* Himalaya.
fulva, *Muhl.* United States.
missouriensis, *Nutt.* N. America.
Pseudacorus, *L.* Europe, &c.
setosa, *Pall.* E. Siberia.
— var. atropurpurea.
sibirica, *L.* Europe, &c.
spuria, *L.* Mediterranean region, &c.
— var. notha (*Bieb.*).
versicolor, *L.* N. America.

Isatis tinctoria, *L.* Europe, &c.

Isopyrum fumarioides, *L.* Europe, &c.

Iva xanthifolia, *Nutt.* N. America.

Juncus balticus, *Willd.* Europe, &c.
Chamissonis, *Kunth.* Andes.
compressus, *Jacq.* Temperate regions.

Juncus—*cont.*
effusus, *L.* Europe, &c.
glaucus, *Sibth.* Europe, &c.
lamprocarpus, *Ehrh.* Europe, &c.
maritimus, *Lam.* Temperate regions.
squarrosus, *L.* Europe.
tenuis, *Willd.* Europe, &c.

Kochia scoparia, *Schrad.* Europe, &c.

Koeleria cristata, *Pers.* N. temperate regions.
phleoides, *Pers.* Mediterranean region.

Lactuca canadensis, *L.* N. America.
hirsuta, *Muhl.* N. America.
ludoviciana, *Riddel.* N. W. America.
muralis, *E. Mey.* Europe, &c.
perennis, *L.* Europe.
Plumieri, *Gren. & Godr.* France.

Lallemantia peltata, *Fisch. & Mey.* Caucasus.

Lamarckia aurea, *Moench.* Mediterranean region.

Lapsana communis, *L.* Europe.

Lasthenia glabrata, *Lindl.* California.

Lathyrus angulatus, *L.* Europe.
Aphaca, *L.* Europe, &c.
articulatus, *L.* W. Mediterranean region.
Clymenum, *L.* Mediterranean region.
filiformis, *Gay.* S. Europe.
hirsutus, *L.* Europe, &c.
latifolius, *L.* Europe.
— var. ensifolius (*Badaro*).
macrorrhizus, *Wimm.* Europe.
montanus, *Bernh.* Europe.
niger, *Bernh.* Europe, &c.
Ochrus, *DC.* Mediterranean region.
pannonicus, *Garcke.* var. varius. Europe.
pisiformis, *L.* Europe, &c.
rotundifolius, *Willd.* Orient.
sativus, *L.* Europe, &c.
sphaericus, *Retz.* S. Europe.
sylvestris, *L.* Europe.
— var. Wagneri.

Lathyrus—*cont.*
tingitanus, *L.* W. Mediterranean region.
tuberosus, *L.* Europe, &c.
venosus, *Muhl.* N. America.

Lavatera cachemiriana, *Cambess.* Himalaya.
Olbia, *L.* S. Europe.
thuringiaca, *L.* S. Europe.
trimestris, *L.* Mediterranean region.
— var. alba.

Layia Calliglossa, *A. Gray.* California.
elegans, *Torr. & Gray.* California.
glandulosa, *Hook. & Arn.* California.

Leontodon Ehrenbergii, *Hort. Kew.*

Leontopodium alpinum, *Cass.* Europe, &c.

Lepachys columnaris, *Torr. & Gray.* N. W. America.
var. pulcherrima, *Torr. & Gray.*

Lepidium Draba, *L.* Europe, &c.
incisum, *Roth.* Siberia, &c.
Menziesii, *DC.* N. America.
nebrodense, *Guss.* S. Europe.
sativum, *L.* Orient.
virginicum, *L.* N. America.

Leptosyne Douglasii, *DC.* California.
maritima, *A. Gray.* California.

Lepturus cylindricus, *Trin.* Europe, &c.

Leuzea conifera, *DC.* Mediterranean region.

Liatris scariosa, *Willd.* N. America.
spicata, *Willd.* N. America.
— var. montana, *Gray.*

Ligusticum pyrenaicum, *Gouan.* Pyrenees.
scoticum, *L.* Europe, &c.
Seguieri, *Koch.* S. Europe.

Linaria anticaria, *Boiss. & Reut.* Spain.
bipartita, *Willd.* N. Africa.
Broussonetii, *Char.* Marocco, &c.
chalepensis, *Mill.* S. Europe, &c.

Linaria—*cont.*
dalmatica, *Mill.* Dalmatia.
genistifolia, *Mill.* Europe, &c.
— var. linifolia, *Grab.*
italica, *Trevir.* Europe.
maroccana, *Hook. f.* Marocco.
minor, *Desf.* Europe, &c.
peloponnesiaca, *Boiss.& Heldr.* Greece.
praetermissa, *Delastre.* France.
purpurea, *L.* Europe.
reticulata, *Desf.* N. Africa, &c.
— var. purpurea.
saxatilis, *Hoffmgg. & Link.* Portugal.
spartea, *Hoffmgg. & Link.* W. Mediterranean region.
triornithophora, *Willd.* Portugal.
triphylla, *Mill.* Mediterranean region.
tristis, *Mill.* Spain.

Lindelophia spectabilis, *Lehm.* Himalaya.

Lindheimera texana, *A. Gray.* Texas.

Linum alpinum, *L.* Europe, &c.
angustifolium, *Huds.* Europe, &c.
grandiflorum, *Desf.* Algeria.
— var. coccineum.
nervosum, *Waldst. & Kit.* Hungary.
perenne, *L.* N. temperate regions.
usitatissimum, *L.* Europe, &c.

Lithospermum latifolium, *Michx.* N. America.

Loasa hispida, *L.* Peru.
muralis, *Griseb.* Chili.
vulcanica, *André.* New Grenada.

Lobelia Erinus, *L.* S. Africa.
tenuior, *R. Br.* Australia.
triquetra, *L.* S. Africa.

Lolium multiflorum, *Lam.* Europe.
perenne, *L.* Europe, &c.

Lonas inodora, *Gaertn.* Sicily, &c.

Lopezia coronata, *Andr.* Mexico.

Lophanthus rugosus, *Fisch. & Mey.* China.

Lotus corniculatus, *L.* Temperate regions.
— var. Delorti, (*Timb.*).
major, *Scop.* Europe.
ornithopodioides, *L.* Mediterranean region.
siliquosus, *L.* Mediterranean region.
tenuis, *Waldst. & Kit.* Europe, &c.
Tetragonolobus, *L.* Mediterranean region.

Lunaria annua, *L.* Europe.
rediviva, *L.* Europe.

Lupinus affinis, *Agardh.* California.
angustifolius, *L.* Mediterranean region.
arboreus, *Sims.* California.
Cosentini, *Guss.* Sicily.
Crukshanksii, *Hook.* Peru, &c.
elegans, *H. B. & K.* Mexico.
Menziesii, *Agardh.* California.
micranthus, *Dougl.* N. America.
mutabilis, *Sw.* New Grenada.
polyphyllus, *Lindl.* California.
pubescens, *Benth.* New Grenada.
pulchellus, *Sweet.* Mexico.
recurvatus, *Meyen.* Chili.
subcarnosus, *Hook.* Texas.
tricolor, *Hort.* Garden origin.
varius, *L.* S. Europe.

Luzula angustifolia, *Poir.* N. America.
campestris, *DC.* Europe, &c.
nivea, *DC.* Europe.

Lychnis chalcedonica, *L.* Russia.
Coeli-rosea, *Backh.* Levant.
— var. elegans. *Hort.*
coronaria, *Desr.* Europe.
dioica, *L.* Europe, &c.
Flos-cuculi, *L.* Europe, &c.
Flos-jovis, *Desr.* S. Europe.
Githago, *Scop.* Europe.
haageana, *Lemaire.* Japan.
Lagaseae, *Hook. f.* Spain.
pauciflora, *Ledeb.* Siberia.
Viscaria, *L.* Europe.

Lysimachia ciliata, *L.* N. America.
davurica, *Ledeb.* Siberia, &c.
decurrens, *Forst.* China, &c.

Lysimachia—*cont.*
punctata, *L.* Europe, &c.
quadrifolia, *L.* N. America.
vulgaris, *L.* Europe, &c.

Lythrum Graefferi, *Tenore.* Temperate regions.
Salicaria, *L.* N. temperate regions.
— var. rosea.
virgatum, *L.* Europe, &c.

Madia elegans, *D. Don.* N. W. America.
sativa, *Molina.* N. America, &c.
— var. racemosa, *Gray.*

Malcolmia africana, *R. Br.* South Europe, &c.
chia, *DC.* Greece, &c.
littorea, *R. Br.* S. Europe, &c.
maritima, *R. Br.* Mediterranean region.

Malope trifida, *Cav.* Spain and N. Africa.
— var. alba.

Malva Alcea, *L.* Europe.
crispa, *L.* Europe.
Duriaei, *Hort. Kew.* Algeria.
moschata, *L.* Europe.
— var. alba.
oxyloba, *Boiss.* Orient.
parviflora, *L.* Europe.
sylvestris, *L.* Europe, &c.
— var. alba.

Malvastrum limense, *Ball.* Chili.

Mandragora officinarum, *L.* Mediterranean region.

Marrubium astracanicum, *Jacq.* Asia Minor.
pannonicum, *Reichb.* E. Europe.
peregrinum, *L.* Europe, &c.
vulgare, *L.* Europe, &c.

Matricaria inodora, *L.* Europe, &c.
— var. discoidea (*DC.*).

Matthiola bicornis, *DC.* Asia Minor, &c.

Meconopsis cambrica, *Vig.* Europe.
nepalensis, *DC.* Himalaya.
Wallichi, *Hook.* Himalaya.

Medicago apiculata, *Willd.* Europe.
denticulata, *Willd.* Europe, &c.
Echinus, *DC.* Mediterranean region.
lappacea, *Desr.* Europe.
littoralis, *Rhode.* Mediterranean region.
lupulina, *L.* N. temperate regions.
marina, *L.* Europe, &c.
minima, *L.* Europe, &c.
Murex, *Willd.* Europe.
orbicularis, *All.* Europe.
sativa, *L.* Europe, &c.
tuberculata, *Willd.* Mediterranean region.
turbinata, *Willd.* Mediterranean region.

Melica altissima, *L.* S. Europe, &c.
ciliata, *L.* Europe, &c.
— var. penicillaris, (*Boiss. & Bal.*).
glauca, *F. Schultz*, var. nebrodensis, (*Parl.*). Europe.
nutans, *L.* Europe, &c.

Melilotus alba, *Desr.* Europe, &c.
officinalis, *Lam.* Europe, &c.

Melissa officinalis, *L.* Mediterranean region, &c.

Melittis Melissophyllum, *L.* Europe.

Mentzelia Lindleyi, *Torr. & Gray.* California.

Mercurialis annua, *L.* Europe, &c.

Mesembryanthemum cordifolium, *L.* South Africa.
pyropeum, *Haw.* S. Africa.

Mimulus cardinalis, *Dougl.* N. America.
cupreus, *Regel.* Chili.
glabratus, *H. B. & K.* Mexico.
luteus, *L.* N. America.

Mirabilis Jalapa, *L.* Tropical America.

Modiola multifida, *Moench.* N. W. America.

Molinia caerulea, *Moench.* Europe, &c.
— var. variegata.

Monolepis trifida, *Schrad.* Siberia, &c.

Moricandia arvensis, *DC.* Europe, &c.

Morina persica, *L.* Himalaya, &c.

Moscharia pinnatifida, *Ruiz & Pav.* Chili.

Muehlenbergia glomerata, *Trin.* N. America.
mexicana, *Trin.* N. America.
sylvatica, *Torr. & Gray.* N. America.
Willdenovii, *Trin.* N. America.

Muscari Argaei, *Hort.* Greece?
armeniacum, *Baker.* Armenia.
atlanticum, *Boiss. & Reut.* Spain, &c.
grandifolium, *Baker.* Origin uncertain.
Heldreichii, *Boiss.* Greece.
moschatum, *Willd.* Asia Minor.
neglectum, *Guss.* Mediterranean region.
racemosum, *Mill.* Europe, &c.
szovitsianum, *Baker.* Caucacus, &c.

Myosotis arvensis, *Lam.* Europe, &c.
cespitosa, *Schultz.* Northern regions.
collina, *Hoffm.* Europe.
sylvatica, *Hoffm.* Northern regions.

Myosurus minimus, *L.* Europe, &c.

Myrrhis odorata, *Scop.* Europe, &c.

Nardus stricta, *L.* Europe, &c.

Nemesia floribunda, *Lehm.* Cape of Good Hope.
pubescens, *Benth.* Cape of Good Hope.
versicolor, *E. Mey.* Cape of Good Hope.

Nemophila aurita, *Lindl.* California
insignis, *Dougl.* California.
— var. grandiflora, *Hort.*
maculata, *Benth.* California.
Menziesii, *Hook. & Arn.* California, &c.

Nemophila—*cont.*
parviflora, *Dougl.* N. W. America.

Nepeta concolor, *Boiss. & Heldr.* Asia Minor.
Mussini, *Spreng.* Caucasus.
Nepetella, *L.* S. Europe.
nuda, *L.* S. Europe, &c.
spicata, *Benth.* W. Himalaya.
suavis, *Stapf.* N. W. Himalaya.

Nicandra physaloides, *Gaertn.* Peru.

Nicotiana alata, *Link & Otto.* S. Brazil.
Langsdorffii, *Schrank.* Brazil.
paniculata, *L.* S. America.
rustica, *L.* Mexico.
Tabacum, *L.* S. America.

Nigella damascena, *L.* Mediterranean region.
hispanica, *L.* Spain, &c.
sativa, *L.* Mediterranean region.

Nolana atriplicifolia, *D. Don.* Peru.
prostrata, *L.* Peru, Chili, &c.

Nonnea decumbens, *Moench.* W. Mediterranean region.

Nothoscordum fragrans, *Kunth.* Mexico, &c.

Œnanthe crocata, *L.* Europe.
globulosa, *L.* S. Europe, &c.
Lachenali, *C. C. Gmelin.* S. Europe, &c.
peucedanifolia, *Pollich.* Europe.
pimpinelloides, *L.* Europe, &c.
silaifolia, *Bieb.* Europe, &c.
— var. australis, *Wulf.* Carniola.

Œnothera amoena, *Lehm.* California.
— var. rubicunda, *Hort.*
berteriana, *Spach.* Chili.
biennis, *L.* N. America.
bistorta, *Nutt.* N.W. America.
dentata, *Cav.* N. America, &c.
epilobifolia, *H. B. & K.* New Grenada.
fruticosa, *L.* N. America.
— var. Youngii, *Hort.*
glauca, *Michx.* N. America.

Œnothera—*cont.*
odorata, *Jacq.* Chili.
pumila, *L.* N. America.
rosea, *Ait.* N. America, &c.
speciosa, *Nutt.* N. America.
tenella, *Cav.* Chili.
tetraptera, *Cav.* Mexico.
triloba, *Nutt.* N. America.

Omphalodes linifolia, *Moench.* S. Europe.

Onobrychis sativa. *Lam.* Europe, &c.

Ononis arvensis, *L.* Europe.
Natrix, *L.* Mediterranean region.
repens, *L.* Europe.
rotundifolia, *L.* Europe.
spinosa, *L.* Europe.
— var. alba.

Onopordon Acanthium, *L.* Europe.
sibthorpianum, *Boiss.* Asia Minor, &c.
tauricum, *Willd.* S. Europe.

Opopanax Chironium, *Koch.* Mediterranean region.

Orchis foliosa, *Soland.* Madeira.
incarnata, *L.* Europe, &c.
latifolia, *L.* Europe, &c.
maculata, *L.* Europe and Asia Minor.
— var. superba.

Origanum vulgare, *L.* Europe, &c.
— var. album.

Ornithogalum arcuatum, *Stev.* Caucasus.
narbonense, *L.* Mediterranean region.
orthophyllum, *Tenore.* Italy.
tenuifolium, *Guss.* S. Europe, &c.

Ornithopus perpusillus, *L.* Europe, &c.

Orobanche minor, *Sutt.* Europe.
ramosa, *L.* Europe, &c.

Oxyria elatior, *R. Br.* Nepal.

Oxytropis ochroleuca, *Bunge.* Siberia, &c.

Paeonia arietina, *Anders.* Orient.
— var. Andersoni.

Paeonia—*cont.*
decora, *Anders.* Thrace, Asia Minor.
— var. Pallasii, *Hort.*
peregrina, *Mill.* Orient.

Palaua dissecta, *Benth.* Peru, &c.

Pallenis spinosa, *Cass.* Mediterranean region.

Panicum capillare, *L.* W. hemisphere.
colonum, *L.* Tropics
Crus-galli, *L.* S. Europe, &c.
miliaceum, *L.* Tropical regions.
proliferum, *Lam.* N. America.
sanguinale, *L.* Cosmopolitan.

Papaver aculeatum, *Thunb.* S. Africa.
Argemone, *L.* Europe, &c.
caucasicum, *Bieb.* Caucasus.
dubium, *L.* Europe.
— var. Lecoqii (*Lamotte*), Europe.
glaucum, *Boiss. & Hausskn.* Syria.
laevigatum, *Bieb.* Greece, Asia Minor.
lateritium, *C. Koch.* Armenia.
nudicaule, *L.* Arctic and Alpine regions.
— var. album.
orientale, *L.* Asia Minor.
— var. bracteatum, (*Lindl.*).
— var. majus.
pavoninum, *Mey.* Afghanistan, &c.
pilosum, *Sibth. & Sm.* Greece.
Rhoeas, *L.* Europe, &c.
— var. Hookeri, (*Baker*).
— var. "Shirley."
rupifragum, *Boiss. & Reut.* Spain, Marocco.
— var. atlanticum, *Ball.*
somniferum, *L.* China, &c.

Parietaria officinalis, *L.* S. Europe, &c.

Parnassia nubicola, *Wall.* Himalaya.
palustris, *L.* N. hemisphere.

Pennisetum cenchroides, *Rich.* Tropical and subtropical regions.
orientale, *Rich.* Orient.
villosum, *R. Br.* Abyssinia.

Pentstemon barbatus, *Roth.* W. United States.
campanulatus, *Willd.* Mexico.
coeruleus, *Nutt.* W. United States.
confertus, *Dougl.* Rocky mountains.
diffusus, *Dougl.* W. North America.
glaber, *Pursh.* W. United States.
Hartwegii, *Benth.* Mexico.
laevigatus, *Soland.* var. Digitalus, *Gray.* N. Amer.
ovatus, *Dougl.* N.W. America.
pubescens, *Soland.* N. America.
Richardsonii, *Dougl.* Oregon.

Perezia multiflora, *Less.* Brazil.

Petunia nyctaginiflora, *Juss.* Argentina.

Peucedanum coriaceum, *Reichb. f.* S. Europe.
gallicum, *Latour.* Europe.
graveolens, *Benth.* India.
Ostruthium, *Koch.* Europe.
paucifolium, *Ledeb.* Caucasus.
sativum, *Benth. & Hook. f.* Europe.
Sowa, *Kurz.* India.

Phacelia bipinnatifolia, *Michx.* N. America.
campanularia, *A. Gray.* California.
divaricata, *A. Gray.* California.
hispida, *A. Gray.* California.
loasaefolia, *Torr.* California.
Parryi, *Torr.* California.
tanacetifolia, *Benth.* California.
viscida, *Torr.* N. America.
Whitlavia, *A. Gray.* California.
— var. alba, *Hort.*

Phaenospherma globosa, *Munro.* China.

Phalaris canariensis, *L.* S. Europe.
paradoxa, *L.* Mediterranean region.
tuberosa, *L.* Mediterranean region.

Phaseolus multiflorus, *Willd.* Mexico.
ricciardianus, *Tenore* Origin uncertain.

Phaseolus—*cont.*
tuberosus, *Lour.* Cochinchina.
vulgaris, *L.* Cultivated.

Phleum asperum, *Jacq.* Europe, &c.
Boehmeri, *Wibel.* Europe, &c.
pratense, *L.* Europe.
— var. nodosum, (*L.*).

Phlomis setigera, *Falc.* Himalaya.
tuberosa, *L.* S. Europe, Asia Minor, &c.
umbrosa, *Turcz.* China, &c.

Physalis Alkekengii, *L.* Europe.
chenopodiifolia, *Lam.* Peru.
peruviana, *L.* Tropics.
viscosa, *L.* Tropical America.

Physochlaina orientalis, *G. Don.* Orient.

Physostegia virginiana, *Benth.* var. speciosa, *A. Gray.* N. America.

Phyteuma canescens, *Waldst. & Kit.* Europe.
Halleri, *All.* Europe.
limonifolium, *Sibth. & Sm.* S. Europe, Asia Minor.
Michelii, *All.* Europe.
orbiculare, *L.* Europe.
spicatum, *L.* Europe.

Phytolacca acinosa, *Roxb.* Himalaya, &c.

Picridium tingitanum, *Desf.* Mediterranean region.

Picris hieracioides, *L.* Europe, &c.

Pimpinella Anisum, *L.* Greece, &c.
magna, *L.* Europe, &c.

Pisum elatius, *Bieb.* Mediterranean region, &c.

Plantago amplexicaulis, *Cav.* Mediterranean region.
arenaria, *Waldst. & Kit.* Europe, &c.
Coronopus, *L.* Europe, &c.
Cynops, *L.* Europe, &c.
Lagopus, *L.* Mediterranean region.
lanceolata, *L.* Europe, &c.
major, *L.* Europe, &c.
maritima, *L.* Europe, &c.
media, *L.* Europe.
Oreades, *Decne.* Colombia.

Plantago—*cont.*
ovata, *Forsk.* Mediterranean region.
patagonica, *Jacq.* N. & S. America.

Platycodon grandiflorum, *A.DC.* China and Japan.
— var. Mariesii, *Hort.*

Platystemon californicus, *Benth.* California.

Pleurospermum pulchrum, *Aitch. & Hemsl.* Afghanistan.

Poa alpina, *L.* N. & Arctic regions.
— var. badensis, (*Haenke*).
caesia, *Sm.* N. temperate regions.
Chaixii, *Vill.* Europe, &c.
chinensis, *L.* China, &c.
compressa, *L.* N. temperate regions.
pratensis, *L.* N. temperate regions.
trivialis, *L.* N. temperate regions.
violacea, *Bell.* S. Europe.

Podolepis acuminata, *R. Br.* Australia.

Podophyllum Emodi, *Wall.* Himalaya.

Polemonium caeruleum, *L.* N. temperate regions.
— var. album, *Hort.*
flavum, *Greene.* N. America.
himalayanum, *Baker.* Himalaya.
mexicanum, *Cerv.* Mexico.
pauciflorum, *S.Wats.* Mexico.
reptans, *L.* N. America.

Polygonatum verticillatum, *All.* Europe, &c.

Polygonum alpinum, *All.* S. Europe, &c.
aviculare, *L.* N. temperate regions.
Bistorta, *L.* N. regions.
capitatum, *Buch-Ham.* Himalaya.
compactum, *Hook. f.* Japan.
molle, *D.Don.* Himalaya.
orientale, *L.* Tropics of Old World.

Polygonum—*cont.*
viviparum, *L.* N. arctic regions.
Weyrichii, *F. Schmidt.* Sachalin Island.

Polypogon monspeliensis, *Desf.* Temperate & tropical regions.

Polypteris texana, *A. Gray* Texas, &c.

Potentilla alchemilloides, *Lapeyr.* Pyrenees.
argentea, *L.* N. temperate regions.
— var. calabra (*Tenore*).
arguta, *Pursh.* N. America.
argyrophylla, *Wall.* Himalaya.
aurea, *L.* Eur. var. ambigua, (*Gaud.*).
collina, *Wibel.* Europe, &c.
Detommasii, *Tenore.* S. Europe.
dichtliana, *Kern.* Europe.
digitata × flabellata. Europe.
glandulosa, *Lindl.* California, &c.
heptaphylla, *Mill.* Europe.
hirta, *L.* S. Europe, &c.
kotschyana, *Fenzl.* Kurdistan.
kurdica, *Boiss.* Kurdistan.
montenegrina, *Pantoc.* Montenegro.
multifida, *L.* Europe, &c.
nepalensis, *Hook.* Himalaya.
nevadensis, *Boiss.* Spain.
opaca, *L.* Europe.
pennsylvanica, *L.* N. America, &c.
— var. arachnoidea, *Lehm.*
pseudo-chrysantha, *Hort.* Origin uncertain.
pyrenaica, *Ramond.* Pyrenees.
recta, *L.* Europe, &c.
— var. laciniata.
— var. palmata.
rupestris, *L.* Europe, &c.
schrenkiana, *Regel.* Central Asia.
semi-argentea, *Hort.* ×.
semi-laciniata, *Hort.* Garden origin.
Sibbaldia, *Hall. f.* Europe, &c.
Thurberi, *A. Gray.* N. America.

Potentilla—*cont.*
Visianii, *Panč.* Servia.
wrangeliana, *Fisch. & Mey.* Siberia.

Poterium canadense, *A. Gray.* N. America.
Sanguisorba, *L.* N. temperate regions.

Prenanthes purpurea, *L.* Europe.

Primula cortusoides, *L.* Japan, Siberia, &c.
denticulata, *Sm.* Himalaya.
japonica, *A. Gray.* Japan.
obconica, *Hance.* China.
Poissoni, *Franch.* China.
rosea, *Royle.* Himalaya.
verticillata, *Forsk.* Arabia.

Prunella grandiflora, *Jacq.* Europe.
— var. laciniata, *Hort.*
— var. rubra, *Hort.*
vulgaris, *L.* Temperate regions.

Psoralea macrostachya, *DC.* California.
physodes, *Hook.* N. W. America.

Pyrrhopappus carolinianus, *DC.* N. America.

Ramondia pyrenaica, *Rich.* Pyrenees.

Ranunculus acris, *L.* Europe, &c.
— var. Steveni.
arvensis, *L.* Europe, &c.
Broteri, *Freyn.* Spain.
brutius, *Tenore.* S. Europe, &c.
caucasicus, *Bieb.* Caucasus.
chaerophyllus, *L.* Mediterranean region, &c.
Cymbalaria, *Pursh.* N. America, &c.
Flammula, *L.* N. temperate regions.
Lingua, *L.* Europe, &c.
muricatus, *L.* Europe, &c.
parviflorus, *L.* Europe, &c.
repens, *L.* N. temperate regions.

Raphanus sativus, *L.* Europe.

Rapistrum linnaeanum, *Boiss. & Reut.* S. Europe.

Reseda alba, *L.* Europe, &c.
glauca, *L.* Pyrenees.
lutea, *L.* Europe, &c.
Luteola, *L.* Europe, &c.
odorata, *L.* Origin unknown.
Phyteuma, *L.* Mediterranean region.
virgata, *Boiss. & Reut.* Spain and Portugal.

Rhagadiolus Hedypnois, *Fisch. & Mey.* Caucasus, &c.
stellatus, *Gaertn.* S. Europe.

Rheum collinianum, *Baill.* China.
Emodi, *Wall.* Himalaya.
Franzenbachii, *Muent.* Temperate Asia.
macropterum, *Mart.* Origin uncertain.
officinale, *Baill.* Thibet.
palmatum, *L.* China.
— var. tanghuticum.
Rhaponticum, *L.* Siberia.
rugosum, *Desf.* Origin uncertain.
undulatum, *L.* Siberia, &c.
webbianum, *Royle.* Himalaya.

Rhexia virginica, *L.* N. America.

Roemeria hybrida, *DC.* S. Europe.

Rudbeckia amplexicaulis, *Vahl.* N. America.
californica, *A. Gray.* California.
hirta, *L.* N. America.
laciniata, *L.* N. America.
occidentalis, *Nutt.* N. America.

Rumex abyssinicus, *Jacq.* Abyssinia.
alpinus, *L.* Europe, &c.
Berlandieri, *Meissn.* California.
Brownii, *Campd.* Australia.
nepalensis, *Spreng.* Himalaya.
obtusifolius, *L.* Europe, &c.
— var. sylvestris (*Wallr.*).
occidentalis, *S. Wats.* N. W. America.
Patientia, *L.* S. Europe, &c.
pulcher, *L.* Europe, &c.
roseus, *L.* Mediterranean region, &c.
salicifolius, *Weinm.* N. America.

Ruta graveolens, *L.* S. Europe.

Sagina glabra, *Fenzl.* Europe.
— var. pilifera, (*Fenzl*).

Salvia Aethiopis, *L.* S. Europe, &c.
argentea, *L.* Mediterranean region.
Beckeri, *Trautv.* Caucasus.
clandestina, *L.* Europe.
glutinosa, *L.* Europe, &c.
grandiflora, *Etling.* Asia Minor.
hians, *Royle.* Himalaya.
Horminum, *L.* Mediterranean region.
— var. bracteis roseis.
— var. bracteis violaceis.
interrupta, *Schousb.* Marocco.
lanceolata, *Brouss.* N. W. America.
lyrata, *L.* N. America.
napifolia, *Jacq.* Asia Minor, &c.
nutans, *L.* S. E. Europe.
officinalis, *L.* Mediterranean region.
pratensis, *L.* Europe, &c.
— var. alba.
— var. Baumgarteni, (*Heuff.*)
— var. rosea.
schiedeana, *Stapf.* Mexico.
Sclarea, *L.* Mediterranean region.
sylvestris, *L.* var. alba. Eur.
tiliaefolia, *Vahl.* Mexico.
Verbenaca, *L.* Europe, &c.
— var. disermas, (*Sibth. & Sm.*)
verticillata, *L.* S. Europe.
virgata, *Ait.* Europe.
viscosa, *Jacq.* Europe.

Sanvitalia procumbens, *Lam.* Mexico.

Saponaria calabrica, *Guss.* Italy, &c.
ocymoides, *L.* Europe.
orientalis, *L.* Orient.
Vaccaria, *L.* Europe, &c.

Saracha Jaltomata, *Schlecht.* Mexico.

Satureja hortensis, *L.* Mediterranean region, &c.
montana, *L.* Europe, &c.

Saxifraga aphylla, *Sternb.* Europe.
— var. leptophylla.

Saxifragra—*cont.*
Aizoon, *L.* Europe.
— var. Churchillii, Kern.
— var. Gaudinii, (*Bruegg.*).
— var. incrustata.
— var. infracta.
— var. Malyi.
— var. minor.
— var. pectinata, (*Schott*).
— var. pygmaea.
— var. recta, (*Lapeyr.*).
— var. rotata.
— var. rosularis, *Schleich.*
bulbifera, *L.* Europe.
caespitosa, *L.* N. & arctic regions.
— var. hirta.
cartilaginea, *Willd.* Caucasus, &c.
cochlearis, *Reichb.* S. Europe.
Cotyledon, *L.* Europe.
— var. pyramidalis, (*Lapeyr.*).
crustata, *Vest.* Alps of Europe.
granulata, *L.* Europe.
Hostii, *Tausch.* Europe.
— var. altissima (*Kern.*). Styria.
— var. macnabiana, *Hort.*
hypnoides, *L.* Europe.
kolenatiana, *Regel.* Asia Minor.
lactea, *Turcz.* Siberia.
lingulata, *Bell.* S. Europe.
— var. lantoscana, (*Boiss. & Reut.*).
longifolia, *Lapeyr.* Pyrenees.
muscoides, *Wulf.* Europe, &c.
— var. pygmaea (*Haw.*).
pedatifida, *Ehrh.* S. France.
peltata, *Torr. & Gray.* California.
rocheliana, *Sternb.* E. Europe.
— var. coriophylla, (*Griseb.*).
rotundifolia, *L.* Europe.
— var. hirsuta.
sedoides, *L.* Europe.
sponhemica, *C. C. Gmelin.* var. hirta, (*Don*). Eur.
tenella, *Wulf.* Carniola.
tricuspidata, *Rottb.* N. & arctic regions.
umbrosa, *L.* W. Europe.
valdensis, *DC.* Piedmont, &c.

Scabiosa amoena, *Jacq.* Asia Minor, &c.
arvensis, *L.* Europe, &c.
atropurpurea, *L.* S. Europe, &c.

Scabiosa—*cont.*
australis, *Wulf.* S. Europe, &c.
Columbaria, *L.* Europe, &c.
graminifolia, *L.* S. Europe, &c.
gramuntia, *L.* Mediterranean region.
integrifolia, *L.* Greece & Asia Minor.
isetensis, *L.* Caucasus, &c.
lancifolia, *Lernat.* Algeria.
lucida, *Vill.* Europe.
macedonica, (*Griseb.*). Macedonia.
micrantha, *Desf.* E. Europe, Asia Minor, &c.
palaestina, *L.* Syria, &c.
Portae, *Huter.* Europe.
prolifera, *L.* Syria.
Pterocephala, *L.* Greece.
ucranica, *L.* S. Europe.
vestina, *Facc.* Europe.

Scandix Balansae, *Reut.* Asia Minor.
brachycarpa, *Guss.* Sicily, Syria.
macrorhyncha, *C. A. Mey.* Asia Minor.

Schismus marginatus, *Beauv.* S. Europe, &c.

Schizanthus pinnatus, *Ruiz & Pav.* Chili.
retusus, *Hook.* Chili & Peru.

Schizopetalum Walkeri, *Sims.* Chili.

Scilla bifolia, *L.* Europe, Asia Minor.
chinensis, *Benth.* China.
festalis, *Salisb.* W. Europe.
hispanica, *Mill.* Europe.
— var. alba.
— var. rubra.
lingulata, *Poir.* N. Africa.
verna, *Huds.* W. Europe.

Scirpus Caricis, *Retz.* Europe.
setaceus, *L.* Europe, &c.

Scleranthus annuus, *L.* Europe, &c.
perennis, *L.* Europe, &c.

Sclerocarpus uniserialis, *Benth. & Hook. f.* Mexico.

Scolymus maculatus, *L.* Europe.

Scopolia lurida, *Dun.* Himalaya.

Scorpiurus vermiculata, *L.* Mediterranean region.

Scorzonera hispanica, *L.* S. Europe.

Scrophularia alata, *Gilib.* Europe.
aquatica, *L.* Europe.
nodosa, *L.* N. temperate regions.
sylvatica, *Boiss. & Heldr.* Greece.
vernalis, *L.* Europe.

Scutellaria albida, *L.* S. E. Europe.
alpina, *L.* Europe, &c.
altissima, *L.* Caucasus, &c.
baicalensis, *Georgi.* Siberia, &c.
galericulata, *L.* N. temperate regions.

Secale Cereale, *L.* Orient.
— var. villosum.

Securigera Coronilla, *L.* S. Europe.

Sedum Aizoon, *L.* Siberia.
album, *L.* Europe, &c.
coeruleum, *Vahl.* S. Europe.
Ewersii, *Ledeb.* Siberia, &c.
hispanicum, *L.* S. Europe.
hybridum, *L.* Siberia.
magellense, *Ten.* Greece, Asia Minor.
maximum, *Sut.* Europe, &c.
— var. atropurpureum.
middendorfianum, *Maxim.* Amurland.
roseum, *Scop.* N. temperate regions.
villosum, *L.* Europe, &c.
wallichianum, *Hook. f. & Thoms.* Himalaya.

Selinum Gmelini, *Bray.* N. regions.

Sempervivum fimbriatum, *Schnittsp.* Tyrol.
mettenianum, *Schnittsp.* Switzerland.
montanum, *L.* Alps and Pyrenees.

Senecio adonidifolius, *Loisel.* Europe.
aegyptius, *L.* Egypt.
Doria, *L.* Europe, &c.
Doronicum, *L.* Europe.
elegans, *L.* S. Africa.
— var. alba.
— var. purpurea.

Senecio—*cont.*
Fuchsii, *C. C. Gmel.* Europe.
japonicus, *Sch. Bip.* Japan.
macrophyllus, *Bieb.* Caucasus.
suaveolens, *Ell.* N. America.
thyrsoideus, *DC.* S. Africa.
vernalis, *Waldst. & Kit.* Europe.
viscosus, *L.* Europe, &c.

Serratula coronata, *L.* Siberia.
— var. macrophylla.
Gmelinii, *Ledeb.* Siberia.
quinquefolia, *Bieb.* Caucasus.
tinctoria, *L.* Europe.

Seseli gummiferum, *Sm.* Crimea.
tortuosum, *L.* S. Europe, &c.

Setaria glauca, *Beauv.* Europe, &c.
italica, *Beauv.* Tropical and subtropical regions.
macrochaeta, *Spreng.* India, &c.
verticillata, *Beauv.* Cosmopolitan.
viridis, *Beauv.* Cosmopolitan.

Sherardia arvensis, *L.* Europe, &c.

Sibthorpia peregrina, *L.* Mauritius, &c.

Sicyos bryoniaefolia, *Moris.* Chili.

Sidalcea candida, *A. Gray.* New Mexico.

Sideritis scordioides, *L.* S. Europe.

Silene alpestris, *Jacq.* Alps.
Armeria, *L.* Europe.
chloraefolia, *Sm.* var. swertifolia. Asia Minor.
Chouletii, *Coss.* Algeria.
ciliata, *Pourr.* S.W. Europe.
clandestina, *Jacq.* S. Africa.
colorata, *Poir.* Mediterranean region.
conoidea, *L.* Europe.
cretica, *L.* S. Europe.
Cucubalus, *Wibel.* Europe, &c.
echinata, *Otth.* S. Europe.
fimbriata, *Sims.* Caucasus.
Fortunei, *Vis.* China.
fuscata, *Link.* Mediterranean region.
gallica, *L.* Europe.
glauca, *Pourr.* Spain.

Silene—*cont.*
italica, *Pers.* Mediterranean region.
juvenalis, *Delile.* Asia Minor.
laeta, *A. Br.* W. Mediterranean region.
linicola, *C. C. Gmel.* Germany.
longicilia, *Otth.* Spain, &c.
maritima, *With.* Europe.
nutans, *L.* Europe, &c.
obtusifolia, *Willd.* W. Mediterranean region.
paradoxa, *L.* S. Europe.
pendula, *L.* Mediterranean region.
pseudo-atocion, *Desf.* N. Africa.
quadrifida, *L.* Europe.
rubella, *L.* Europe, &c.
Sartori, *Boiss.* Greece.
Saxifraga, *L.* Europe.
Schafta, *Gmel.* Caucacus.
sedoides, *Jacq.* Mediterranean region.
stylosa, *Bunge.* Siberia.
tatarica, *Pers.* E. Europe, &c.
tenuis, *Willd.* Siberia.
undulata, *Ait.* S. Africa.
vallesia, *L.* Europe.
vesiculifera, *J. Gay.* Asia Minor.
vespertina, *Retz.* Mediterranean region.
Zawadskii, *Herbich.* Transsylvania, &c.

Silphium perfoliatum, *L.* N. America.
scaberrimum, *Ell.* N. America.
trifoliatum, *L.* N. America.

Silybum eburneum, *Coss. & Dur.* N. Africa, &c.
Marianum, *Gaertn.* Europe.

Sisymbrium assoanum, *Losc. & Pard.* Spain.
austriacum, *Jacq.* Europe.
erysimoides, *Desf.* Mediterranean region, &c.
hispanicum, *Jacq.* Spain.
multifidum, *Willd.* Siberia.
officinale, *Scop.* S. Europe, &c.
polyceratium, *L.* Europe, &c.
Sophia, *L.* Temperate regions.
strictissimum, *L.* Europe.
tanacetifolium, *L.* Europe.

Sisyrinchium angustifolium, *Mill.* N. America.
bermudiana, *L.* Bermuda.
striatum, *Sm.* Argentina, &c.

Sium erectum, *Huds.* Europe, &c.
latifolium, *L.* Europe, &c.

Smilacina racemosa, *Desf.* N. America.
stellata, *Desf.* N. America.

Smyrnium Olusatrum, *L.* Europe, &c.

Solanum guineense, *Lam.* Trop. Africa.
rostratum, *Dun.* Mexico.
villosum, *Willd.* Europe.

Solidago canadensis, *L.* N. America.

Sonchus oleraceus, *L.* Europe.
palustris, *L.* Europe, &c.

Sorghum vulgare, *Pers.* Tropical and subtropical regions.

Sparganium simplex, *Huds.* Europe, &c.

Specularia falcata, *A.DC.* Mediterranean region.
— var. castellana, *Lange.*
pentagonia, *A.DC.* Asia Minor.
perfoliata, *A.DC.* N. America.
Speculum, *A.DC.* Europe, &c.

Spergula arvensis, *L.* Europe.

Spiraea Aruncus, *L.* N. temperate regions.
decumbens, *Koch.* Europe.
digitata, *Willd.* Siberia.
palmata, *Thunb.* Japan.
Ulmaria, *L.* Europe, &c.

Stachys alpina, *L.* Europe.
— var. intermedia.
arvensis, *L.* N. temperate regions.
Betonica, *Benth.* Europe, &c.
— var. alba.
grandiflora, *Benth.* Asia Minor, &c.
spinulosa, *Sibth. & Sm.* Greece, &c.
setifera, *C. A. Mey.* Asia Minor.
sylvatica, *L.* Europe, &c.

Statice bellidifolia, *Gouan.* Europe.
densiflora, *Guss.* S. Europe.
Gmelinii, *Willd.* Caucasus, &c.
gougetiana, *Girard.* Spain.
Limonium, *L.* Europe, &c.
Suworowii,, *Regel.* Central Asia.
tatarica, *L.* Caucasus, &c.
Thouini, *Viv.* Mediterranean region.
tomentella, *Boiss.* S. Russia.

Stevia Eupatoria, *Willd.* Mexico.
ovata, *Lag.* Mexico.

Stipa Aristella, *L.* Mediterranean region.

Stipa Calamagrostis, *Wahlenb.* Europe.
pennata, *L.* Europe, &c.

Swertia cordata, *Wall.* Himalaya.
perennis, *L.* N. temperate regions.
punctata, *Baumg.* Transyl.

Symphyandra Hofmanni, *Pant.* Bosnia.
pendula, *A.DC.* Caucasus.
Wanneri, *Heuff.* Transsylvania.

Symphytum officinale, *L.* Europe.

Syrenia sessiliflora, *Ledeb.* S. Russia, &c.

Tagetes lucida, *Cav.* Mexico.
patula, *L.* Mexico.
pusilla, *H.B. & K.* Ecuador.

Tamus communis, *L.* Europe, &c.

Taraxacum gymnanthum, *DC.* Mediterranean region.

Telephium Imperati, *L.* Mediterranean region, &c.

Tellima grandiflora, *R.Br.* N.W. America.

Tetragonia crystallina, *L'Herit.* Peru.
expansa, *Murr.* Australia.

Teucrium Arduini, *L.* S. Europe.
Botrys, *L.* Europe, &c.
canadense, *L.* N. America.
Chamaedrys, *L.* Europe, &c.
— var. aurea.
hircanicum, *L.* Caucasus.
multiflorum, *L.* Spain.
Scorodonia, *L.* Europe.

Thalictrum angustifolium, *L.* Europe, &c.
— var. nigricans, (*DC.*).
aquilegifolium, *L.* Europe, &c.
— var. purpureum.
flavum, *L.* Europe, &c.
— var. sphaerocarpum, (*Lej. & Court*).
glaucum, *Desf.* Spain.
minus, *L.* Europe, &c.
— var. affine (*Jord.*).
— var. concinnum (*Willd.*).
— var. elatum (*Jacq.*).
— var. pubescens (*Schleich.*).
— var. purpurascens(*Georgi*).

Thelesperma filifolium, *A. Gray.* N.W. America.

Thermopsis lanceolata, *R. Br.* Siberia.
montana, *Nutt.* N. America.

Thlaspi alliaceum, *L.* Europe.
alpestre, *L.* Europe, &c.
arvense, *L.* Europe, &c.
ceratocarpon, *Murr.* Asia Minor, &c.
perfoliatum, *L.* Europe, &c.
praecox, *Wulf.* Austria.

Thymus azoricus, *Lodd.* Azores.
comosus, *Heuff.* Transsylvania.
Serpyllum, *L.* Europe, &c.

Tigridia Pavonia, *Ker-Gawl.* Mexico.

Tinantia fugax, *Scheidw.* Tropical America.

Tinguarra sicula, *Benth. & Hook. f.* Sicily, &c.

Tofieldia calyculata, *Wahlenb.* Europe, &c.

Tordylium cordatum, *Poir.* Crete, &c.

Trachelium caeruleum, *L.* W. Mediterranean region.

Trachymene pilosa, *Sm.* Australia.

Tragopogon majus, *Jacq.* Europe.
orientalis, *L.*, Europe, &c.
pratensis, *L.* Europe, &c.

Tridax trilobata, *Hemsl.* Mexico.

Trifolium bifidum, *Gray.* var. decipiens. California.
glomeratum, *L.* Europe.
hybridum, *L.* Europe.
incarnatum, *L.* Europe.
Lagrangei, *Boiss.* Orient.
leucanthum, *Bieb.* Crimea, &c.
medium, *L.* Europe.
minus, *Sm.* Europe.
multistriatum, *Koch.* E. Europe.
pannonicum, *L.* Europe, &c.
Perreymondi, *Gren. & Godr.* France.
pratense, *L.* Europe.
repens, *L.* Europe.
resupinatum, *L.* Europe.
roscidum, *Greene.* California.
rubens, *L.* Europe.
squarrosum, *L.* S.W. Europe.
tomentosum, *L.* S. Europe.
tridentatum, *Lindl.* N.W. America.

Triglochin maritimum, *L.* Europe.
palustre, *L.* Europe.

Trigonella corniculata, *L.* S. Europe.
coerulea, *Ser.* E. Europe.
cretica, *Boiss.* Crete.
Foenum-graecum, *L.* S. Europe.
ovalis, *Boiss.* Spain.
polycerata, *L.* S. Europe.
radiata, *Boiss.* Orient.

Trillium grandiflorum, *Salisb.* N. America.

Trinia Hoffmanni, *Bieb.* E. Europe. &c.
Kitaibelii, *Bieb.* E. Europe, &c.

Tripteris cheiranthifolia, *Schultz.* Abyssinia.

Trisetum distichophyllum, *Beauv.* Europe.
flavescens, *Beauv.* Europe, &c.

Triticum Aegilops, *Beauv.* Orient.
durum, *Desf.* S. Europe, N. Africa.
monococcum, *L.* Europe.
ovatum, *Rasp.* Europe.
triunciale, *Rasp.* Europe.

Tritonia crocosmaeflora, *Hort.* Garden origin.
Pottsii, *Benth.* S. Africa.

Trollius asiaticus, *L.* Siberia, &c.
europaeus, *L.* Europe, &c.
— var. napellifolius.

Tropaeolum aduncum, *Sm.* Peru, &c.
majus, *L.* Peru.
minus, *L.* Peru.

Troximon glaucum, *Nutt.* N.W. America.
grandiflorum, *A. Gray.* N.W. America.
laciniatum, *A. Gray.* N. America.

Tunica illyrica, *Boiss.* S. Europe, &c.
prolifera, *Scop.* Europe, &c.
Saxifraga, *Scop.* Europe, &c.

Urospermum Dalechampii, *Desf.* S. Europe.
picroides, *Desf.* S. Europe.

Urtica dioica, *L.* Europe.
membranacea, *Poir.* S. Europe.
pilulifera, *L.* Europe.
— var. balearica, (*L.*).

Valeriana alliariaefolia, *Vahl.* Europe.
— var. intermedia.
officinalis, *L.* Europe.
— var. exaltata, (*Mikan*).
— var. sambucifolia, (*Mikan*).
Phu, *L.* Caucasus.

Valerianella carinata, *Loisel.* Europe, &c.
coronata, *DC.* S. Europe.
dentata, *Poll.* Europe, &c.
echinata, *DC.* Europe, &c.
eriocarpa, *Desv.* Europe, &c.
olitoria, *Poll.* Europe, &c.
vesicaria, *Moench.* S. Europe, &c.

Veratrum album, *L.* Europe, &c.
nigrum, *L.* Europe, &c.
viride, *Ait.* N. America.

Verbascum Blattaria, *L.* Europe.
Chaixii, *Vill.* S.W. Europe.
malacotrichum, *Boiss. & Heldr.* S. Europe, &c.
nigrum, *L.* Europe, &c.
phlomoides, *L.* Europe, &c.
phoeniceum, *L.* Europe, &c.
pyramidatum, *Bieb.* Crimea, &c.
sinuatum, *L.* Europe, &c.
speciosum, *Schrad.* E. Europe.
Thapsus, *L.* Europe.

Verbena Aubletia, *L.* N. America.
bonariensis, *L.* S. America.
caroliniana, *Michx.* S. United States.
officinalis, *L.* Europe, &c.
prostrata, *R.Br.* California.
venosa, *Gill. & Hook.* Buenos Ayres.

Vernonia altissima, *Nutt.* United States.

Veronica agrestis, *L.* Europe, &c.
aphylla, *L.* Europe, &c.
austriaca, *L.* Europe, &c.
— var. pinnatifida.
Bidwillii, *Hook. f.* N. Zealand.
exaltata, *Maud.* Siberia.
gentianoides, *Vahl.* S. E. Europe, &c.
incana, *L.* S. Russia, &c.
incisa, *Ait.* Siberia.
longifolia, *L.* Europe, &c.
— var. alba.
— var. Hostii.
— var. mollis.
— var. rosea.
— var. subsessilis, *Miq.*
Lyallii, *Hook f.* N. Zealand.
officinalis, *L.* Europe, &c.
repens, *DC.* Corsica.
saxatilis, *Scop.* Europe.
serpyllifolia, *L.* Europe, &c.
spicata, *L.* Europe, &c.
Teucrium, *L.* Europe, &c.
— var. latifolia, (L.).
virginica, *L.* N. America.
— var. japonica, (*Steud.*).

Vesicaria grandiflora, *Hook.* Texas.

Vicia amphicarpa, *Dorth.* S. Europe, &c.
atropurpurea, *Desf.* S. Europe.
bithynica, *L.* Mediterranean region.
calcarata, *Desf.* Mediterranean region, &c.
Cracca, *L.* N. hemisphere.
disperma, *DC.* S. W. Europe.
Ervilia, *Willd.* S. Europe, &c.
Faba, *L.* Cultivated.
— var. equina, (*Steud.*).
gigantea, *Hook.* N. W. America.

Vicia—*cont.*
narbonensis, *L.* Mediterranean region.
pannonica, *Crantz.* Europe.
pyrenaica, *Pourr.* Pyrenees.
sativa, *L.* Europe, &c.
sepium, *L.* Europe, &c.
sicula, *Guss.* Sicily.
sylvatica, *L.* Europe.
unijuga, *A. Braun.* Siberia.
varia, *Host.* Europe.
villosa, *Roth.* Europe, &c.

Vincetoxicum fuscatum, *Reichb. f.* E. Europe, &c.
nigrum, *Moench.* Europe, &c.
officinale, *Moench.* Europe.
elatior, *Fries.* Europe, &c.
Jooi, *Janka.* Transylvania.
lactea, *Sm.* Europe.
odorata, *L.* Europe, &c.
palustris, *L.* N. temperate regions.
rothomagensis, *Desf.* Europe.
striata, *Ait.* N. America.
syrtica, *Sünd.* Europe.
tricolor, *L.* Europe, &c.

Wahlenbergia capensis, *A.DC.* S. Africa.
gracilis, *A.DC.* Australia.

Wahlenbergia—*cont.*
graminifolia, *A DC.* Italy, &c.
undulata, *A.DC.* S. Africa.

Wulfenia carinthiaca, *Jacq.* Carinthia.

Xanthium strumarium, *L.* Europe, &c.

Xanthocephalum gymnospermoides, *Benth. & Hk. f.* Arizona.

Xeranthemum annuum, *L.* S. Europe, &c.
cylindraceum, *Sibth. & Sm.* Europe, &c.

Zaluzianskya capensis, *Walp.* S. Africa.

Zinnia elegans, *Jacq.* Mexico.
multiflora, *L.* Mexico.
tenuiflora, *Jacq.* Mexico, &c.

Ziziphora capitata, *L.* E. Europe.
tenuior, *L.* S. Europe, Asia Minor, &c.

Zygadenus elegans, *Pursh.* N. America.

TREES AND SHRUBS.

Acer campestre, *L.* Europe.
— var. hebecarpum, *DC.*
circinatum, *Pursh.* N.W. America.
hyrcanum, *Fisch. & Mey.* Caucasus.
insigne, *Boiss. & Buhse.* N. Persia.
macrophyllum, *Pursh.* California, &c.
monspessulanum, *L.* Europe.
opulifolium, *Vill.* var. obtusatum. Europe.
platanoides, *L.* Europe.
— var. integrilobum.
— var. Schwedleri.
Pseudo-Platanus, *L.* Eur., &c.
— var. euchlorum.
— var. purpurascens.
— var. purpureum, *Hort.*
tataricum, *L.* E. Eur., &c.

Ailantus glandulosa, *Desf.* China.

Alnus cordifolia, *Ten.* Italy.
firma, *S. & Z.* Japan.
glutinosa, *Gaertn.* Eur.
— var. rubronervia, *Hort.*
— var. sorbifolia, *Hort.*
incana, *Willd.* N. hemisphere.
— var. laciniata, *Hort.*
japonica, *Sieb. & Zucc.* Japan.
rhombifolia, *Nutt.* California, &c.
serrulata, *Willd.* N. Amer.
viridis, *DC.* Northern hemisphere.

Amelanchier canadensis, *Torr. & Gray.* N. Amer.

Amorpha fruticosa, *L.* N. Amer.

Aucuba japonica, *Thunb.* Japan.

Baccharis halimifolia, *L.* N. Amer.

Berberis aristata, *DC.* Himalaya.
— var. floribunda.

Berberis—*cont.*
Aquifolium, *Pursh.* W. N. Amer.
— var. fascicularis, *Nichols.*
— var. murrayana, *Hort.*
canadensis, *Pursh.* N. Amer.
Darwinii, *Hook.* Chili.
Lycium, *Royle.* Himalaya.
sinensis, *Desf.* China, &c.
stenophylla, *Moore.* Garden hybrid.
Thunbergi, *DC.* Japan.
virescens, *Hook. f.* Himalaya.
vulgaris, *L.* Europe, &c.
— var. iberica, *Hort.*
— var. foliis purpureis.
wallichiana, *DC.* Himalaya.

Betula alba, *L.* N. Hemisph.
— var. costata.
— var. tristis.
— var. Youngii, *Hort.*
davurica, *Pall.* Siberia, &c.
papyracea, *Ait.* N. Amer.
pumila, *L.* N. Amer.

Buddleia japonica, *Hemsl.* Japan.

Buxus sempervirens, *L.* Europe, &c.
— var. austriaca.
— var. latifolia.

Calycanthus occidentalis, *Hook. & Arn.* California.

Caragana arborescens, *Lam.* Siberia, &c.
frutescens, *DC.* South Russia to Japan.
— var. grandiflora.
pygmaea, *DC.* Siberia.
— var. aurantiaca.

Carpinus Betulus, *L.* Europe, &c.
— var. incisa.
laxiflora, *Blume.* Japan.
orientalis, *Mill.* S. Europe.

Catalpa speciosa, *Warder.* N. America.

Ceanothus americanus, *L.* E. United States.
cuneatus, *Nutt.* California.
thyrsiflorus, *Eschsch.* California.

Celastrus articulatus, *Thunb.* Japan.
scandens, *L.* N. Amer.

Celtis occidentalis, *L.* N. Amer.

Cistus laurifolius, *L.* S.W. Europe.

Cladrastis amurensis, *Benth.* Amurland.

Clematis Flammula, *L.* S. Eur., &c.
fusca, *Turcz.* China & Japan.
integrifolia, *L.* Europe.
ligusticifolia, *Nutt.* N. Amer.
Pitcheri, *Torr. & Gray.* var. lasiostylis.
Vitalba, *L.* Europe, &c.

Colutea arborescens, *L.* Eur., &c.
cruenta, *Ait.* Orient.

Coriaria japonica, *A. Gray.* Japan.

Cornus alba, *L.* N. Asia.
alternifolia, *L. f.* N. Amer.
Amomum, *Mill.* N. Amer.
macrophylla, *Wall.* N. India to Japan.
Mas, *L.* Europe, &c.
sanguinea, *L.* Europe.

Cotoneaster affinis, *Lindl.* Himal.
bacillaris, *Wall.* Himal.
— var. floribunda, *Hort.*
— var. obtusa, *Hort.*
buxifolia, *Wall.* Himal.
frigida, *Wall.* Himal.
horizontalis, *Decne.* Himal.
laxiflora, *Jacq.* Siberia.
lucida, *Schlecht.* Origin unknown.
microphylla, *Wall.* Himal.
Nummularia, *Fisch. & Mey.* Europe, Asia.
rotundifolia, *Wall.* Himal.
Simonsii, *Baker.* Himal.
thymifolia, *Baker.* Himal.

Crataegus coccinea, *L.* N. Amer.
— var. acerifolia, *Hort.*
— var. glandulosa, *Hort.*
— var. indentata, *Lodd.*
— var. macracantha, *Dudley.*
— var. maxima, *Hort.*
cordata, *Ait.* N. Amer.

Crataegus—*cont.*
Crus-Galli, *L.* N. Amer.
— var. arbutifolia, *Hort.*
— var. ovalifolia, *Lindl.*
— var. prunifolia, *Torr. & Gray.*
— var. splendens, *Lodd.*
Douglasii, *Lindl.* West, N. America.
flava, *Ait.* N. America.
heterophylla, *Fluegg.* Orient.
melanocarpa, *Bieb.* Caucasus.
mollis, *Scheele.* United States.
nigra, *Waldst. & Kit.* E. Europe.
orientalis, *Pall.* Orient.
Oxyacantha, *L.* Eur.
— var. fusca, *Hort.*
pentagyna, *Kit.* E. Europe.
pinnatifida, *Bunge.* var. major, *N. E. Br.* China, &c.
punctata, *Jacq.* N. Amer.
Pyracantha, *Pers.* var. Lalandii, *Hort.*
rivularis, *Nutt.* West. N. Amer.
sinaica, *Boiss.* Orient.
tanacetifolia, *Pers.* Orient.
tomentosa, *L.* N. Amer.
uniflora, *Muench.* N. Amer.

Cupressus Benthami, *Endl.* Mexico.
lawsoniana, *Murr.* California, &c.
lusitanica, *Mill.*
nootkatensis, *Lamb.* N. W. Amer.

Cytisus albus, *L.* S.W. Eur.
— var. incarnatus, *Hort.*
biflorus, *L'Herit.* Eur.
monspessulanus, *L.* S. Eur.
nigricans, *L.* Eur.
— var. longispicatus, *Hort.*
praecox, *Hort.* Garden origin.
purpureus, *Scop.* E. Eur.
scoparius, *L.* Eur.
— var. andréanus.
— var. pendulus, *Hort.*
sessilifolius, *L.* Eur.
supinus, *L.* Eur.

Daboëcia polifolia, *D. Don.* W. Eur.

Daphne Mezereum, *L.* Europe.
— var. flore albo.

Deutzia crenata, *S. & Z.* Japan.
scabra, *Thunb.* Japan.

Elaeagnus longipes, *A. Gray.* Japan.
umbellata, *Thunb.* Japan.

Erica stricta, *Donn.* S. Eur.

Euonymus europaeus, *L.* Eur.
latifolius, *Scop.* Eur.

Forsythia suspensa, *Vahl.* Japan, &c.

Fraxinus berlandieriana, *D.C.* N. Amer.
longicuspis, *Sieb. & Zucc.* Japan.
Ornus, *L.* Europe.

Gaultheria Shallon, *Pursh.* N. Amer.

Genista aethnensis, *DC.* Sicily.
pilosa, *L.* Europe.
radiata, *Scop.* S. Eur.
sagittalis, *L.* Eur.
tinctoria, *L.* var. elatior. Europe.
virgata, *DC.* Madeira.

Halesia tetraptera, *L.* N. Amer.

Hamamelis virginica, *L.* N. Amer.

Hedera Helix, *L.* Eur., &c.

Hippophae rhamnoides, *L.* Eur. &c.

Hypericum Ascyron, *L.* N. Asia, &c.
Androsaemum, *L.* Eur.
calycinum, *L.* Orient.
elatum, *Ait.* N. Amer.

Ilex Aquifolium, *L.* Eur.
— var. platyphylla, *Hort.*
verticillata, *A. Gray.* N. Amer.

Kalmia glauca, *Ait.* N. Amer.
latifolia, *L.* N. Amer.

Laburnum alpinum, *J. S. Presl.* Europe.
vulgare, *J. S. Presl.* Eur.
— var. involutum, *Hort.*
— var. quercifolium, *Hort.*

Leycesteria formosa, *Wall.* Himal.

Ligustrum Ibota, *Sieb.* Japan.
vulgare, *L.* Europe.

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Lonicera glauca, *Hill.* N. Amer.
Morrowii, *A. Gray.* Japan.
orientalis, *Lam.* Asia Minor.
parvifolia, *Edgw.* Himalaya.
segreziensis, *Hort.* Garden origin.
tatarica, *L.* Siberia.
Xylosteum, *L.* Eur.

Lyonia ligustrina, *DC.* N. Amer.

Magnolia soulangeana, *Hort.* Garden origin.
tripetala, *L.* United States.

Menispermum canadense, *L.* N. Amer.

Morus nigra, *L.* Temperate Asia.

Myrica cerifera, *L.* United States.

Neillia opulifolia, *Benth. & Hook.* N. Amer.

Olearia Haastii, *Hook. f.* N. Zeal.

Paulownia imperialis, *Sieb. & Zucc.* Japan.

Pernettya mucronata, *Gaudich.* Chili, &c.

Philadelphus hirsutus, *Nutt.* Oregon.

Platanus occidentalis, *L.* N. Amer.

Potentilla fruticosa, *L.* North hemisphere.

Prunus acida, *Borkh.* var. semperflorens.
Avium, *L.* Europe, &c.
Brigantiaca, *Chaix.* S.E. France.
Capollin, *Zucc.* Mexico, &c.
cerasifera, *Ehrh.* Caucasus. ?
divaricata, *Ledeb.* Caucasus.
Laurocerasus, *L.* var. colchica.
lusitanica, *L. f.* Portugal.
maritima, *Wangenh.* N. Amer.
Persica, *Stokes.* var. foliis rubris.
pumila, *L.* N. Amer.

Ptelea trifoliata, *L.* N. Amer.
— var. glauca.

Pyrus americana, *DC.* N. Amer.
Aria, *L.* var. angustifolia, *Lindl.*
— var. graeca, *Boiss.*
— var. Hostii.
— var. lutescens, *Hort.*

Pyrus—*cont.*
arbutifolia, *L.* N. Amer.
Aucuparia, *Gaertn.* Eur.
baccata, *L.* Asia.
— var. microcarpa.
— var. obconoidea.
betulaefolia, *Bunge.* Japan, &c.
Cydonia, *L.* S. Europe, &c.
decaisneana, *Nichols.* Origin unknown.
floribunda, *Nichols.* Japan.
lanata, *D. Don.* Himalaya.
lobata, *Nichols.* Caucasus.
Maulei, *Mast.* Japan.
pinnatifida, *Ehrh.* Eur.
Ringo, *Maxim.* Japan.
rotundifolia, *Bechst.* Europe.
Sorbus, *Gaertn.* var. pyriformis, *Lodd.* Europe.
spuria, *DC.* Hybrid origin.
Toringo, *Sieb.* Japan.
torminalis, *DC.* Europe.

Rhamnus carolinianus, *Walt,* S.U. States.
catharticus, *L.* Europe, &c.
davuricus, *Pall.* Asia.
Frangula, *L.* Europe.
— var. angustifolius.

Rhodotypus kerrioides, *Sieb. & Zucc.* Japan.

Rhus Cotinus, *L.* Europe.
radicans, *L.* N. America.
succedanea, *L.* China and Japan.
Ribes alpinum, *L.* Europe.
— var. pumilum, *Hort.*
aureum, *Pursh.* N.W. Amer.
sanguineum, *Pursh.* N.W. Amer.
— var. atrosanguineum, *Hort.*
— var. epruinosum, *K. Koch.*
— var. glutinosum, *A. Gray.*

Rosa agrestis, *Savi.* Europe.
— var. inodora (*Fries*).
alpina, *L.* Eur. var. inermis.
arkansana, *Porter.* N. Amer.
beggeriana, *Schrenk.* Asia.
blanda, *Ait.* N. America.
californica, *Cham. & Schlecht.* W. N. America.
— var ultramontana.

Rosa—*cont.*
canina, *L.* Eur. &c.
— var. andegavensis, *Baker.*
— var. arvatica, *Baker.*
— var. Bakeri. (*Déségl.*)
— var. coriifolia, *Baker.*
var. dumetorum (*Thuill.*).
carolina, *L.* N. Amer.
cinnamomea, *L.* Eur. &c.
— var. sibirica.
damascena, *Mill.* Orient, &c.
Englemannii, *S. Wats.* W.N. Amer.
Fendleri, *Crépin.* New Mexico.
ferruginea, *Vill.* Europe.
fulgens, *Christ.* Switzerland.
hibernica, *Sm.* Britain.
lucida, *Ehrh.* N. Amer.
— var. grandiflora.
macrophylla × rugosa.
micrantha, *Sm.*, var. Briggsi, *Baker.*
microphylla, *Roxb.* China.
moschata, *Mill.* India, &c.
multiflora, *Thunb.* Japan.
nitida, *Willd.* N. Amer.
nutkana, *Presl.* N. Amer.
omissa, *Déségl.* Eur.
pisocarpa, *A. Gray.* West. N. Amer.
pomifera, *Herrm.* Europe.
repens, *Scop.* Europe.
— var. Andersoni, *Hort.*
— var. capreolata, *Hort.*
rubiginosa, *L.* Europe, &c.
— var. major, *Hort.*
rugosa, *S. & Z.* Japan.
— var. alba.
sericea, *Lindl.* Himal.
spinosissima, *L.* Eur.
— var. altaica.
tomentosa, *Sm.* Europe.
wichuraiana, *Crépin.* Japan.
Wilsoni, *Borrer.* Britain.

Rubus biflorus, *Buch.-Ham.* Himalaya.
caesius, *L.* Europe.
calvatus, *Blox.* Europe.
Colemani, *Blox.* Europe.
deliciosus, *James.* Rocky Mountains.
dumetorum, *W. & N.* var. ferox.
echinatus, *Lindl.* Britain.

Rubus—*cont.*
Koehleri, *W. & N.* Europe.
laciniatus, *Willd.*
leucostachys, *Sm.* Europe.
lindleyanus, *Lees.* Britain.
macrophyllus, *W. & N.* Europe.
mucronatus, *Blox.* Britain.
nutkanus, *Moç.* W.N. Amer.
occidentalis, *L.* N. Amer.
pubescens, *Auct. Angl.* Britain.
rhamnifolius, *W.& N.* Europe.
sorbifolius, *Maxim.* China.
suberectus, *Anders.* Europe.
ulmifolius, *Schott.* Europe.
villicaulis, *W. & N.* Europe.

Sambucus glauca, *Nutt.* West N. Amer.
nigra, *L.* Eur. &c.
— var. aurea.
— var. laciniata.
— var. swindonensis, *Hort.*
— var. virescens, *Hort.*
racemosa, *L.* North hemisphere.

Skimmia Fortunei, *Mast.* (S. japonica, *Hort.*) China.

Smilax herbacea. *L.* N. Amer.
rotundifolia, *L.* N. Amer.

Spartium junceum, *L.* S. Eur.

Spiraea betulifolia, *Pall.* N. Amer. &c.
canescens, *D.Don.* Himal.
carpinifolia, *Pall.* Eur.
Douglasii, *Hook.* N.W. Amer.
japonica, *L. f.* Japan.
— var. alba.
— var. Bumalda.
— var. glabra, *Hort.*
— var. glabrata, *Nichols.*
— var. ruberrima, *Hort.*
lindleyana, *Wall.* Himal.
Margaritae, *Zabel.* Garden origin.

Spiraea—*cont.*
nobleana, *Hook.* California.
paniculata, *L.* N. Amer.
salicifolia, *L.* N. Amer.
— var. lancifolia.
— var. rosea.
sorbifolia, *L.* N. Asia.

Staphylea pinnata, *L.* Europe.

Symphoricarpus racemosus, *Michx.* N. America.

Taxus baccata, *L.* Eur. &c.
— var. adpressa.
— var. Dovastonii, *Hort.*
— var. fastigiata.
— var. fructu-luteo, *Hort.*
— var. sinensis.
— var. Washingtoni, *Hort.*
cuspidata, *S. & Z.* Japan.

Thuja gigantea, *Nutt.* W. N. Amer.
occidentalis, *L.* N. America.
orientalis, *L.* China and Japan.

Ulex europaeus, *L.* Eur.

Vaccinium padifolium, *Sm.* Madeira.

Viburnum cassinoides, *L.* N. America.
dentatum, *L.* N. Amer.
— var. montanum.
Lantana, *L.* Europe.
molle, *Michx.* N. Amer.
Opulus, *L.* Eur. &c.

Vitis Labrusca, *L.* N. Amer.

*Widdringtonia Whytei, *Rendle.* Central Africa.

Yucca Whipplei, *Torr.* California.

Zelkowa acuminata, *Planch.* Japan.

Zenobia speciosa, *D. Don.* U. S. America.
— var. pulverulenta.

* Not hardy.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX II.—1896.

NEW GARDEN PLANTS OF THE YEAR 1895.

The number of garden plants annually described in botanical and horticultural publications, both English and foreign, is now so considerable that it has been thought desirable to publish a complete list of them in the *Kew Bulletin* each year. The following list comprises all the new introductions recorded during 1895. These lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at this establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

The present list includes not only plants brought into cultivation for the first time during 1895, but the most noteworthy of those which have been re-introduced after being lost from cultivation. Other plants included in the list may have been in gardens for several years, but either were not described or their names had not been authenticated until recently.

In addition to species and botanical varieties, all hybrids, whether introduced or of garden origin, with botanical names, and described for the first time in 1895, are included. It has not been thought desirable, however, to give authorities after the names of garden hybrids in such genera as *Cypripedium*, &c. Mere garden varieties of such plants as *Coleus*, *Codiæum* or *Narcissus* are omitted for obvious reasons.

In every case the plant is cited under its published name, although some of the names are doubtfully correct. Where, however, a correction has appeared desirable, this is made.

The name of the person in whose collection the plant was first noticed or described is given where known.

An asterisk is prefixed to all those plants of which examples are in cultivation at Kew.

The publications from which this list is compiled, with the abbreviation used to indicate them, are as follows:—*B. M.*—Botanical Magazine. *Bruant Cat.*—Bruant's Catalogue of New Plants, 1895. *B. T. O.*—Bulletino della R. Società Toscana di Orticultura. *Bull Cat.*—Bull, Catalogue of New, Beautiful, and Rare Plants. *Gard.*—The

Garden. *G. C.*—Gardeners' Chronicle. *G. and F.*—Garden and Forest. *Gfl.*—Gartenflora. *G. M.*—Gardeners' Magazine. *Ill. H.*—L'Illustration Horticole. *Jard.*—Le Jardin. *J. of H.*—Journal of Horticulture. *J. O.*—Journal des Orchidées. *K. B.*—Bulletin of Miscellaneous Information, Royal Gardens, Kew. *L.*—Lindenia. *O. R.*—Orchid Review. *R. H.*—Revue Horticole. *R. H. B.*—Revue de l'Horticulture Belge. *Sand. Cat.*—Sanders' Catalogue of New Plants, 1895. *Spaeth Cat.*—L. Spaeth, General Nursery Catalogue. *Veitch Cat.*—Veitch & Sons, Catalogue of Plants. *W. G.*—Wiener Illustrirte Garten-Zeitung.

The abbreviations in the descriptions of the plants are:—*ft.*—Foot or Feet. *G.*—Greenhouse. *H.*—Hardy. *H. H.*—Half-hardy. *in.*—Inches. *S.*—Stove.

*__Acacia spadicigera,__ Cham. (*B. M.* t. 7395.) Leguminosæ. S. One of the Bull's-horn Acacias which forms a woody shrub, with large bi-pinnate leaves and large horn-like spines in pairs. The flowers are in axillary clusters on cylindrical heads, 1 in. long. Central America and Cuba. (Kew.)

Acalypha hamiltoniana. (*Bruant Cat.* 1895.) Euphorbiaceæ. Leaves bright green, teeth prominently rounded, yellow. A greenhouse or stove plant used for outside decoration during summer months. (Bruant, Poitiers.)

Acanthophœnix grandis. (*Ill. H.* 1895, 185.) Palmeæ. S. "A handsome palm with finely cut leaves and deep brown spines. Brazil." (L'Horticulture Internationale, Brussels.) [Acanthophœnix is peculiar to the Mascarene Islands.] Also called *Calamus grandis* and stated to be a native of Borneo. (*Ill. H.* 1895, 223.)

Acer Negundo pendula. (*Jard.* 1895, 128.) Sapindaceæ. H. A weeping form of the common Box-elder. (Moser, Versailles.)

Adiantum lineatum. (*Ill. H.* 1895, 185, 312, t. 44.) Filices. S. A variegated maidenhair nearly resembling *A. Claesi.* Brazil. (L'Horticulture Internationale, Brussels.)

Agave Nickelsi. (*R. H.* 1895, 579.) Amaryllideæ. G. Described as a new species somewhat resembling *A. Victoria-reginæ.* Texas.

*__Aglaonema angustifolia,__ N. E. Br. (*K. B.* 1895, 18.) Aroideæ. S. Distinguished by its long, narrow leaves, and silvery grey stem; spathe small, greenish-white. Straits Settlements. (Kew.)

*__Alocasia æquiloba,__ N. E. Br. (*K. B.* 1895, 119.) Aroideæ. S. A new species with pale green, sagittate, lobed leaves, 2 ft. long, and small green spathes. Intermediate between the entire-leaved and pinnatifid-leaved species. New Guinea. (F. Sander & Co.)

*__Alocasia argyrea,__ Sander. (*Sand. Cat.* 1895, 36.) S. Leaves hastate, lanceolate, very large, dark green, with a silvery sheen and prominent midrib. (F. Sander & Co.)

*__Aloe brachystachys,__ Baker. (*B. M.* t. 7399.) Liliaceæ. S. A new species allied to *A. abyssinica*; stem long, slender, erect; leaves ensiform, 2 ft. long, 2 in. broad at the base, bright green, margins spinous; peduncle 2 ft., bearing a cluster of pink and yellow tubular flowers 1 in. long. Zanzibar. (Kew.)

*__Aloe Buchanani,__ Baker. (*K. B.* 1895, 119.) S. A new species, very near *A. Cooperi*, from which it differs by its smaller flowers and leaves rounded at the back. Tropical Africa. (Kew.)

Amaryllis Belladonna, L., vars. (*B. T. O.* 1895, 16, t.) Amaryllideæ. H. H. In this journal C. Sprenger describes and figures four varieties, viz.:—**alba, carminea, magnifica, stenopetala.** (Dammann & Co., Naples.)

*__Amasonia erecta,__ L. (*B. M.* t. 7445.) Verbenaceæ. S. A small shrub with brown stems, alternate, oblong, dark green leaves and erect terminal panicles of tubular white and pink flowers, subtended by orbicular leaf-like bracts, 1 in. long, coloured scarlet and yellow. South America. (Kew.)

*__Amorphophallus galbra,__ Bailey. (*G. C.* 1895, xvii., 484.) Aroideæ. S. Allied to *A. variabilis*, which it resembles in general characters, but the spadix is shorter and the flowers have a pineapple-like fragrance. Queensland. (Kew.)

*__Anemone blanda scythinica.__ (*Gard.* 1895, xlvii., 279.) Ranunculaceæ. H. A form with pale blue and white flowers. N. Kurdistan. (Max Leichtlin, Baden.)

*__Angræcum Smithii,__ Rolfe. (*K. B.* 1895, 37.) Orchideæ. S. A minute, leafless species, with fascicled roots and racemes 1 in. long, bearing small, brownish flowers. Kilimanjaro. (Kew.)

__Angræcum stylosum,__ Rolfe. (*K. B.* 1895, 194.) S. Allied to *A. apiculatum* which it resembles in habit, but the flowers are twice as large; they are white, the spur brownish. Madagascar. (F. Sander & Co.)

__Anguloa Mantini.__ (*Ill. H.* 1895, 187.) Orchideæ. A variety of *A. uniflora* with slightly rose-tinted flowers. Peru. (F. Sander & Co.)

*__Anœctochilus sanderianus,__ Kränzl. (*G. C.* 1895, xviii., 484.) Orchideæ. S. Described as a probable new species. Leaves ovate, 4 in. long, dark olive green with yellowish reticulations; scape 1 ft. high, flowers pale green. Sunda Islands. (F. Sander & Co.) [Since described as *Macodes sanderiana,* Rolfe.]

*__Anthocleista insignis,__ Galpin. (*K. B.* 1895, 150, 158.) Loganiaceæ. S. A tree 70 ft. high, with large, oblong, shining green leaves, 4½ ft. long, 15 in. wide; cymes many flowered; flowers 1½ in. long, yellow. Swaziland. (Kew.)

*__Anthurium andreanum album.__ *Veitch Cat.* 1895, 2.) Aroideæ. S. Flowers as large as the type, but less corrugated, the spadix rigid, the whole pure white. (J. Veitch & Sons.)

*__Anthurium salmoneum.__ (*Ill. H.* 1895, 281, t. 42.) S. A garden hybrid between *A. Lindeni* and *A. andreanum.* (M. Ch. Van Wambeke, Belgium.)

__Anthurium sanderianum.__ (*G. C.* 1895, xvii., 594.) A seedling related to *A. andreanum,* with a large shield-shaped, foliaceous spathe. (F. Sander & Co.)

__Anthurium scherzerianum compacta.__ (*G. C.* 1895, xvii., 467; *G. M.* 1895, 244, fig.) A variety with an almost circular spathe, white, thickly covered with blotches of coral red. (Sir Trevor Lawrence.)

__Anthurium wambekeanum.__ (*Ill. H.* 1895, 185.) S. A garden hybrid between *A. Lindeni* and *A. andreanum.* (L'Horticulture Internationale, Brussels.)

*__Aphaerema spicata,__ Miers. (*B. M.* t. 7398.) Samydaceæ. S. Monotypic. Small shrub with opposite, ovate, cordate, serrated leaves, and small, golden yellow flowers in terminal slender erect racemes. South Brazil. (Kew.)

__Aponogeton Lagrangei.__ (*R. H.* 1895, 380, t.) Naiadaceæ. H. A form of *A. distachyum* with white and rosy flesh-coloured bracts flushed with green at the base. (Lagrange, France.)

__Araucaria imbricata platifolia.__ (*G. C.* 1895, xvii., 468.) Coniferae. H. A form with much broader leaves than the type. (G. Paul & Son.)

__Areca Micholitzii.__ (*Sand. Cat.* 1895, 46.) Palmeæ. S. Stems attaining a height of 9 ft. "Leaves large, sparsely divided." New Guinea. (F. Sander & Co.)

*__Arenga Engleri,__ Becc. (*K. B.* 1895, 19.) Palmeæ. S. Height 5 ft. with fronds bearing numerous pinnæ 16 in. long, dark green above, silvery below; spadices much branched; fruit subglobose, ½ in. in diameter; flowers said to be very fragrant. Formosa. (Hong Kong.)

*__Argylia canescens.__ D. Don. (*B. M.* t. 7414.) Bignoniaceæ. G. Stem fleshy, 9 in. long and 3 in. wide, producing annually flowering stems 18 in. high, bearing alternate, carrot-like leaves and a terminal cluster of tubular flowers 1 in. long and 1½ in. across; colour bright yellow, with red streaks in the throat. Chili. (Kew.)

__Aristolochia dammeriana,__ Mast. (*G. C.* 1895, xvii., 452.) Aristolochiaceæ. An undescribed species met with by Dr. Dammer in Berlin. It is a climber with foliage like that of *A. maxima;* the old stems are covered with corky bark. Central America. (Mr. Buth, Berlin.)

__Arundina Philippii,__ Rchb. f. (*G. and F.* 1895, 504.) Orchideæ S. A near ally of *A. bambusæfolia,* from which it differs in its narrower leaves and smaller flowers; the latter are 1½ in. across, pale lavender with a blotch of crimson on the labellum. (Sir Trevor Lawrence.)

*__Asarum maximum,__ Hemsl. (*G. and F.* 1895, 133.) Aroideæ. Rhizome creeping, leaves cordate, 18 in. high, 8 in. diameter, dark green mottled with grey, as in Cyclamen. Flowers on short stalks, fleshy, three lobed, 2½ in. diameter, maroon purple with a conspicuous eye-like blotch of white. China. (Kew.)

***Asparagus albanense.** (*Ill. H.* 1895, 188.) Liliaceæ. Nearly allied to *A. plumosus.* (F. Sander & Co., St. Albans.)

Astilbe Lemoinei. (*R. H.* 1895, 567, f. 185.) Saxifrageæ. H. A garden hybrid between *A. Thunbergi* and *A.* (Spiræa) *astilboides floribunda.* (Lemoine, Nancy.)

***Atraphaxis Muschketowi,** Krassn. (*B. M.* t. 7435.) Polygonaceæ. H. A dwarf spreading shrub with brown branches and shortly-stalked pale green leaves. Flowers about one-third of an inch broad, white, with red anthers and ovary. Central Asia. (St. Petersburgh B. G.; Kew.)

Batemannia peruviana, Rolfe. (*K. B.* 1895, 193.) Orchideæ. S. Pseudo-bulbs four-angled, 2 in. long; leaves lanceolate, 8 in. long; raceme few flowered, flowers 2 in. across, brown tipped with green, the lip white with purple dots. Peru. (F. Sander & Co.)

Begonia faureana metallica, Rodigas. (*Ill. H.* 1895, 298, t. 43.) Begoniaceæ. S. A variety with more deeply-coloured leaves than the type. (L'Horticulture Internationale, Brussels.)

***Begonia heracleicotyle.** (*Veitch Cat.* 1895, 48.) A garden hybrid between *B. heracleifolia* and *B. hydrocotylifolia.* (J. Veitch & Sons.)

***Begonia margaritacea.** (*Veitch Cat.* 1895, 3.) A garden hybrid, parentage not stated. Apparently related to *B. incarnata.* (J. Veitch & Sons.)

***Bentinckia nicobarica,** Becc. (*Sand. Cat.* 1895, 46.) Palmeæ. Trunk attaining a height of 70 ft. and 9 in. diam. Leaves 8 ft. long, leaflets 2 ft. linear, bright green. (F. Sander & Co.)

Berberis diaphana, Maxim. (*Spaeth Cat.* No. 95, 59.) Berberideæ. H. An upright strong-growing shrub with light green leaves and handsome fruits; spines about an inch long. China. (Spaeth, Rixdorf-Berlin.)

Betula pumila × lenta (*G. and F.* 1895, 243 f. 36.) Cupuliferæ. H. Hybrids between the two species just named have originated in the Arnold Arboretum, and figures of one are given in work just quoted.

Bletia reflexa, Lindl. (*O. R.* 1895, 6.) Orchideæ. G. Plant 1 ft. high; leaves grass-like $\frac{1}{8}$ in. broad; flowers $1\frac{1}{4}$ in. long, purple, the lip veined with brown, the keels white. Mexico. (H. J. Elwes.)

Bollea schroederina, Sander. (*G. C* 1895, xvii., 401, 70.) Orchideæ. Flowers fragrant, wax-like, pure white with the exception of the peculiarly formed lip, which is of a rose-pink colour. Andes of Colombia. (F. Sander & Co.) [A *Zygopetalum.*]

***Bougainvillea glabra sanderiana.** (*Sand. Cat.* 1895.) Nyctagineæ. S. A very floriferous variety. (F. Sander & Co.)

Boussingaultia cordata. (*B. T. O.* 1895, 207.) Chenopodiaceæ. G. A succulent perennial climber nearly allied to *B. baselloides.* Peru. (Dammann & Co., Naples.)

Bulbophyllum carinatum, Cogn. (*J. O.* 1895, 216; *L.* xi., t. 495.) Orchideæ. S. A handsome species nearly related to *B. reticulatum.* Bot. Mag. t. 5605. Borneo. (L'Horticulture Internationale, Brussels.)

***Bulbophyllum disciflorum,** Rolfe. (*K. B.* 1895, 7.) S. Pseudo-bulbs ovoid small, crowded one leaved; leaves 4 in. long; scape short, one flowered; flowers fleshy cupped, 1 in. across, greenish yellow, spotted with red brown; lip covered with purple brown warts. Siam. (L'Horticulture Internationale, Brussels.) [Now removed to the genus *Trias.*]

Bulbophyllum grandiflorum, Blume. (*O. R.* 1895, 104.) S. The giant of the genus. Rhizome creeping, pseudo-bulbs one-leaved; scapes 9 in. long, one-flowered; dorsal sepal $4\frac{1}{2}$ in. by 2 in., greenish-brown with white blotches; lateral sepals 4 in. long, unspotted; petals and lips small. New Guinea. (Sir Trevor Lawrence.)

Caladium lilliputianum. (*Ill. H.* 1895, 186.) Aroideæ. Apparently a variety of *C. argyrites.* Venezuela. (L'Horticulture Internationale, Brussels.) [At p. 363 of the work above quoted this plant is described and figured under the name of *C. lilliputiense,* Rodigas.]

Calamus grandis. (*Ill. H.* 1895, 223.) See under *Acanthophœnix grandis.*

Calanthe laucheana. (*Sand. Cat.* 1895, 8.) Orchideæ. A garden hybrid between *C. sanderiana* and *C. veratrifolia.* (F. Sander & Co.)

Calanthe masuco-tricarinata. (*G. C.* 1895, xvii., 210.) A garden hybrid between the two species indicated in the name. (J. Veitch & Sons.)

***Calathea cyclophora,** Baker. (*K. B.* 1895, 17.) Scitamineæ. S. Allied to *C. zebrina,* but the leaves are green

and the flowers white. British Guiana. (Kew.)

*Calceolaria alba, Ruiz & Pavon. (*G. M.* 1895, xxxviii., 486.) Scrophularineæ. H. H. Shrub, with linear toothed leaves and dense panicles of pure white flowers. Chili. (Kew.)

Calochortus luteus concolor, Baker. (*Gard.* 1895, xlviii., 440, t. 1043.) Liliaceæ. H. A variety of sturdy growth, 1 ft. high, much branched and bearing numbers of rich yellow flowers, slightly marked with chestnut red at the base of the segments. (Wallace & Son.)

*Calochortus Lyoni. (*Gard.* 1895, xlvii., 426.) H. A handsome species with large flowers, pale lilac in colour when opening, but shading to almost white, with dark velvet brown blotches at the base. California? (Wallace & Son.)

Calochortus venustus pictus. (*Gard.* 1895, xlvii., 465.) H. A variety with smaller flowers than the type. Flowers white with rosy spots at the base, and a brown blotch on each segment. California. (Wallace & Son.)

*Campanula mirabilis, Alboff. (*G. C.* 1895, xviii., 616.) Campanulaceæ. H. A remarkable species, allied to *C. Medium*. Caucasus. (Correvon, Geneva.)

Catasetum apertum, Rolfe. (*K.B.* 1895, 284.) Orchideæ. S. Allied to *C. macroglossum*. Pseudo-bulbs fusiform, 5 in. long; leaves lanceolate, 6 in. long; scape erect, 6 in. long; flower segments concave, forming a sort of cup, and coloured apple-green spotted with brown. Habitat not recorded. (Sir Charles Strickland.)

Catasetum collare, Cogn. (*J. O.* 1895, 154.) S. Sepals bright green, petals whitish-green, lip very thick and fleshy, white slightly shaded with green towards the edges on the outer surface. Venezuela. (L'Horticulture Internationale, Brussels.)

Catasetum ferox, Kränzlin. (*G. C.* 1895, xviii., 262.) A new species resembling *C. purum*, Nees, bearing a spike of about twenty flowers of a dirty green colour outside and pea-green inside. (F. Sander & Co.)

Catasetum fimbriatum Cogniauxi, L. Lind. (*L.* xi., t. 499.) Sepals white spotted and suffused with rose-purple; lip broadly oval-triangular irregularly and deeply fringed, lower portion pale or greenish yellow spotted with red-brown, upper portion whitish. Habitat not recorded. (L'Horticulture Internationale, Brussels.)

Catasetum hymenophorum, Cogn. (*J. O.* 1895, 215; *L.* xi., 14.) S. A species nearly allied to *C. chloranthum*, but differing in the general form and colour of the flowers; the sepals are a little more fleshy, the lip forms a pouch relatively wider and less deep, &c. S. America. (L'Horticulture Internationale, Brussels.)

Catasetum imperiale, Lind. and Cogn. (*G. C.* 1895, xvii., 10, f. 44; *O. R.* 1895, 18; *L.* x., t. 460.) Allied to *C. Bungerothii*. S. Sepals white, ¾ in. wide; petals 2 in. long and 1¼ in. wide, white, spotted with crimson-purple. The lip over 2 in. across, rich crimson-purple. Habitat not recorded. [A var. of *C. splendens* ×.]

Catasetum macrocarpum carnosissimum, Cogn. (*L.* xi., 26.) "May "possibly be a monstrosity intermediate "between the male and the female of "this species." (L'Horticulture Internationale, Brussels.)

Catasetum maculatum luteo-purpureum, Cogn. (*J. O.* 1895, 12.) S. A colour variety, the characters of which are indicated by the name.

Catasetum mirabile, Cogn. (*J. O.* 1895, 366; *L.* x., t. 456.) S. A natural hybrid resembling *C. Luciani*. (L'Horticulture Internationale, Brussels.)

Catasetum splendens, Cogn. (*L.* tt. 455, 456, 457.) S. In the work quoted there are coloured plates of varieties *album*, *atropurpureum*, *Aliciæ*. (L'Horticulture Internationale, Brussels.)

Catasetum splendens worthingtonianum. (*L.* xi., 14.) In form resembling *C. splendens* var. *album*, but in colour resembling *C. imperiale*. (H. Worthington.)

Catasetum stupendum, Cogn. (*L.* t. 587.) A synonym of *C. incurvum*. Klotzsch.

Catasetum uncatum, Rolfe. (*K. B.* 1895, 283.) S. Allied to *C. albovirens*. Pseudo-bulbs fusiform 3–8 in. long; leaves lanceolate 12 in. long; scape erect, bearing numerous green flowers. Brazil. (F. Sander & Co.)

Cattleya Aliciæ, L. Lind. (*L.* xi., t. 494.) Orchideæ. G. Sepals and petals white, lip deep rose. Possibly a natural hybrid. (L'Horticulture Internationale, Brussels.)

Cattleya armainvillierensis. (*R. H.* 1895, 359.) G. A garden hybrid between *C. Mendelii* and *C. Gigas*. (Baron E. de Rothschild, Armainvilliers, France.)

Cattleya bowringiana Ashworthii. (*O. R.* 1895, 16.) G. Flowers of a nearly uniform light rose-purple. (E. Ashworth.)

Cattleya floribunda, L. Lind. (*G. and F.* 1895, 224.) G. Described as a possible natural hybrid between *C. maxima* and *C. labiata*, with long scapes bearing twenty flowers, which are carmine or white or variously coloured. Habitat not recorded. (L'Horticulture Internationale, Brussels.)

Cattleya Fowleri. (*G. C.* 1895, xviii., 178, 192, f. 47.) G. A garden hybrid between *C. hardyana* and *C. Leopoldi.* (F. Sander & Co.)

Cattleya gaskelliana delicata. (*O. R.* 1895, 270.) G. Flowers white faintly tinted with lilac, lip deep yellow and purple. (A. A. Peeters, Brussels.)

Cattleya Gigas amplissima, Lind. (*L.* x., t. 461.) G. A large flowered, highly-coloured variety. (L'Horticulture Internationale, Brussels.)

Cattleya hardyana Lindeni. (*G. C.* 1895, xviii., 36; *L.* x., t. 468.) G. A variety with deep rosy-lilac segments, blotches of golden yellow in the throat, and rich carmine coloured, slightly frilled anterior lobe. (L'Horticulture Internationale, Brussels.)

Cattleya lawrenceana atrorubens. (*G. C.* 1895, xvii., 662.) S. A very brilliantly coloured form. (M. Jules Hye-Leysen, Ghent.)

Cattleya lawrenceana concolor. (*G. C.* 1895, xvii., 468.) G. A variety with flowers of a soft rose colour. (Baron Schröder.)

Cattleya lawrenceana Vinckei. (*G. C.* 1895, xvii., 468.) S. A variety with lavender-coloured sepals and petals and dull purple or slate-blue lip. (Baron Schröder.)

Cattleya maxima gigantea. (*G. C.* 1895, xvii., 82.) S. A light-coloured variety. (L'Horticulture Internationale, Brussels.)

Cattleya Mendelii grandis. (*G. C.* 1895, xvii., 662.) G. A form with white segments and rose and yellow markings on the lip. (H. Low & Co.)

Cattleya Mendelii Sanderæ. (*G. C.* 1895, xvii., 662.) G. A richly-coloured form. (F. Sander & Co.)

Cattleya Mossiæ, Hook. (*L.* xi., tt. 482–3.) G. Several varieties are here figured, viz., *Imperator*, *eximia*, *ardens*, *magenta*, *amplissima*, *aurosa*. A much larger number are described. (L'Horticulture Internationale, Brussels.)

Cattleya Mossiæ amœna. (*L.* x., t. 470.) G. This is a pale delicately-coloured variety. (L'Horticulture Internationale, Brussels.)

Cattleya percivaliana magnifica. (*G. C.* 1895, xvii., 337.) G. A very bright and large-flowered form of the type. (F. Hardy.)

Cattleya schilleriana aulcotensis. (*G. C.* 1895, xviii., 154.) G. A form with large flowers, having rose-tinted sepals and petals, and the front part of the lip of the clear bright rich crimson-purple usually observed in *C. Warscewiczii.* (W. Cobb.)

Cattleya Trianæ arkleana. (*O. R.* 1895, 103.) G. A variety with large flowers, the lip 2 in. across and coloured purple-crimson. (J. W. Arkle.)

Cattleya Trianæ Ashtoni. (*G. C.* 1895, xvii., 210.) G. A variety with a very broad open lip. (W. L. Lewis & Co.)

Cattleya Trianæ clinkaberryana. (*G. C.* 1895, xvii., 168.) G. A large flowered variety. (C. G. Roebling, New Jersey, U.S.A.)

Cattleya Trianæ courtauldiana. (*G. C.* 1895, xvii., 295.) G. A variety with a bright violet-crimson lip. (S. Courtauld.)

Cattleya Trianæ roeblingiana. (*G. C.* 1895, xvii., 167.) G. This variety differs in colour from the type. (C. G. Roebling, New Jersey, U.S.A.)

Cattleya Trianæ virginalis. (*G. C.* 1895, xvii., 295.) G. Flowers white, with pale pink front to lip. (S. Courtauld.)

Cattleya Warscewiczii variegata. (*O. R.* 1895, 278.) G. Flower segments variegated with streaks and blotches of rosy-purple on a lighter ground. (E. Marshall.)

Centaurea Margarita. (*G. M.* 1895, xxxviii., 62.) Compositæ. H. A variety of *C. odorata* with dwarf habit and white sweet-scented flowers.

***Cephalanthus natalensis,** Oliver. (*B. M.* t. 7400.) Rubiaceæ. G. A small shrub, with Fuchsia-like leaves 1 in. long and small pink and green flowers in globose, terminal, peduncled heads. South Africa. (Kew.)

Ceropegia debilis, N. E. Br. (*G. C.* 1895, xviii., 358.) Asclepiadeæ. G.

A new species, with succulent leaves 1 in. long, pale purplish flowers, and weak pendulous stems. Nyassaland. (J. O'Brien.)

***Chrysanthemum nipponicum,** Franchet. (*W. G.* 1895, 11, f. 1.) Compositæ. H. H. A dwarf compact shrubby ox-eye daisy. Japan. (Dammann & Co., Naples.)

***Cineraria albicans,** N. E. Br. (*G. C.* 1895, xvii., 39.) Compositeæ. H. H. Stems 1 to 1½ ft. high, clothed with a white cottony tomentum. Leaves somewhat reniform or nearly circular in outline, cordate at the base, 5 to 7 lobed, the lobes usually trilobulate and many-toothed, corymb terminal, few headed; flower-heads 7 to 8 lines in diameter, and of a clear yellow. Natal. (W. E. Gumbleton.)

***Cirrhopetalum compactum,** Rolfe. (*K. B.* 1895, 281.) Orchideæ. S. Allied to *C. parvulum.* Pseudo-bulbs ovoid, small; leaves 1 in. long; scape 2 in. long, bearing a few small, pale yellow flowers. Tenasserim. (Kew.)

***Cirrhopetalum gracillimum,** Rolfe. (*K. B.* 1895, 34.) S. Pseudo-bulbs 1 in. long, angular, one-leaved, leaves oblong, 2½ in. long; scape 6 in. long. Flowers small, reddish-purple. Burma. (T. R. Jarvis.)

Cirrhopetalum mysorense, Rolfe. (*K. B.* 1895, 34.) S. Allied to *C. maculosum.* Pseudo-bulbs angled 1 in. long, monophyllous leaves 3 in. long; scape 4 in. long; flowers 1 in. long, white, with a purple lip. Mysore. (J. O'Brien.)

Cirrhopetalum nodosum, Rolfe. (*K. B.* 1895, 35.) S. Allied to *C. Macraei.* Rhizomes stout and woody; pseudo-bulbs distant, ovate, monophyllous, 2 in. long; leaves 6 in. long; scape 3 in. long; flowers 1½ in. long, reddish, speckled with brown. Nilghiri Hills. (J. O'Brien.)

Cirrhopetalum rothschildianum, J. O'Brien. (*G. C.* 1895, xviii., 608, f. 102.) S. A new species allied to *C. Collettii,* with bright crimson-purple flowers, blotched with yellow on the sepals. Darjeeling. (Hon. W. Rothschild.)

Cirrhopetalum setiferum, Rolfe. (*K. B.* 1895, 35.) S. Allied to *C. picturatum.* Pseudo-bulbs ovoid, 1 in. long; leaves narrow, 10 in. long; scape 10 in. long; flowers umbellate, 2 in. long; sepals and petals setiferous. Himalaya. (J. O'Brien.)

Cirrhopetalum whiteanum, Rolfe. (*K. B.* 1895, 7.) S. Allied to *C. vaginatum,* but smaller and the pseudo-bulbs more crowded; flowers small and yellow. Moluccas? (J. O'Brien.)

Cochlioda noëzliana aurantiaca. (*G. C.* 1895, xvii., 763.) Orchideæ. G. A form with yellower flowers than the type. (Laeken.)

***Cœlogyne carinata,** Rolfe. (*K. B.* 1895, 191.) Orchideæ. S. Pseudo-bulbs four-angled, 2 in. long, two-leaved; leaves oblong lanceolate 5 in. long; scape 4–8 in. long, six-flowered; sepals and petals 1 in. long, whitish-green; lip three-lobed spotted with brown. New Guinea. (F. Sander & Co.)

Cœlogyne lamellata, Rolfe. (*K. B.* 1895, 36.) S. A new species allied to *C. M'Donaldi*; scape erect, three-flowered; flowers whitish-green; sepals and petals oblong lanceolate, keeled, 1⅓ in. long; lip three-lobed, corrugated. New Hebrides. (F. Sander & Co.)

***Cœlogyne Micholitzii,** Sander. (*G. and F.* 1895, 144.) A provisional name for a new introduction from "the East." In habit it resembles *C. barbata,* and it is described as having scapes 2 ft. high, bearing large, pure white flowers. (F. Sander & Co.)

Cœlogyne Veitchii, Rolfe. (*K. B.* 1895, 282.) S. A new species with fusiform pseudo-bulbs 4 in. long, lanceolate leaves 6 in. long and drooping racemes 2 ft. long bearing numerous pure white flowers 1 in. across. New Guinea. (J. Veitch & Sons.)

***Convolvulus macrostegius,** Greene. (*G. C.* 1895, xviii., 405.) Convolvulaceæ. H. H. A climbing plant bearing large yellow flowers. San Miguel, California. (W. E. Gumbleton.)

***Coreopsis abyssinica,** Sch.Bip. (*Gard.* 1895, xlviii., 192.) Compositæ. H. A bushy free-flowering annual, with finely cut leaves and rich yellow flowers, about an inch in diameter. Abyssinia. (Dammann & Co., Naples.)

***Coreopsis grandiflora,** Nutt. (*Gard.* 1895, xlvii., 7, t. 995.) H. A handsome species in the way of *C. lanceolata,* but with larger flowers and pinnate leaves. Southern United States.

Coreopsis japonica. (*W. G.* 1895, 438, f. 41.) H. A compact-growing species with linear-lanceolate leaves and heads of canary-yellow flowers. Japan. (Dammann & Co., Naples.)

Coryanthes maculata vitrina, Rolfe. (*O. R.* 1895, 240.) Orchideæ. S. Flowers light greenish-yellow. (F. Sander & Co.)

Crinum Kircape. (*G. and F.* 1895, 288.) Amaryllideæ. G. A garden hybrid between *C. Kirkii* and *C. capense = longifolium.* (T. L. Mead, Florida.)

***Crinum Moorei variegatum.** (*Bull Cat.* 1895, 6.) Leaves striped with yellow. (W. Bull.)

Cryptophoranthus minutus, Rolfe. (*K. B.* 1895, 5.) Orchideæ. G. A minute species, less than 1 in. high; leaves orbicular; flowers purple. Habitat not recorded. (J. O'Brien.)

Cryptophoranthus oblongifolius, Rolfe. (*K. B.* 1895, 5.) G. Stem 2 in. long. Leaves 3 in.; peduncle short; flowers small, purple and yellow. South America. (Glasnevin.)

***Cycas Wendlandii,** Sander. (*Sand. Cat.* 1895, 32.) Cycadeæ. S. "A handsome species from Madagascar, somewhat resembling the Dioons in habit, but differing in the leaflets, which are not serrated." (Sand. Cat. 1895, 32.)

***Cynanchum formosum,** N. E. Br. (*K. B.* 1895, 112.) Asclepiadeæ. S. A climber with ovate leaves 1-4 in. long and large axillary cymes of small greenish flowers. Peru. (Kew.)

Cyperus ferox. (*B. T. O.* 1895, 253.) Cyperaceæ. G. A tall-growing species with very large inflorescences. S. Brazil. (Dammann & Co., Naples.)

Cyperus reflexus, Vahl. (*B. T. O.* 1895, 253.) G. A densely tufted species with light green leaves. Although a perennial it flowers the same year when raised from seeds and is said to be a graceful ornamental plant. Argentina. (Dammann & Co., Naples.)

Cypripedium Ashtoni. (*G. C.* 1895, xviii., 721.) Orchideæ. S. A garden hybrid between *C. ciliolare superbum* and *C. selligerum majus.* (W. L. Lewis & Co.)

Cypripedium bellatulum album. (*G. C.* 1895, xvii., 748; *O. R.* 1895, 207.) S. A variety with pure white flowers and green leaves. (Sir Frederick Wigan.)

Cypripedium bolerlaerianum. (*G. C.* 1895, xviii., 391.) A garden hybrid between *C. Dautheri* and *C. harrisianum.* (M. Flor Pauwels, Antwerp.)

Cypripedium Burtonii. (*G. C.* 1895, xvii., 801.) S. A garden hybrid with the same parentage as *C. Millmani,* viz. *C. lawrenceanum* and *C. philippinense.* (F. M. Burton.)

Cypripedium calloso-niveum. (*O. R.* 1895, 359,) S. A garden hybrid between the two species indicated in the name.

Cypripedium carnusianum. (*G. C.* 1895, xviii., 102.) S. A garden hybrid between *C. spicerianum* and *C. haynaldianum.* (J. Veitch & Sons.)

Cypripedium Charlesworthi unicolor. (*G. C.* 1895, xviii., 248.) S. A form in which the colour of the lip is the same as the petals and sepals, instead of brown as in the type. (H. Low & Co.)

Cypripedium conco-callosum. (*O. R.* 1895, 15.) S. A garden hybrid between *C. concolor* and *C. callosum.* (R. H. Measures.)

Cypripedium Corndeanii. (*G. C.* 1895, xvii., 627; *O. R.* 1895, 215.) A garden hybrid supposed to be between *C. lawrenceanum* and *C. Sedeni.* (T. W. Swinburne.)

Cypripedium Curtisii pallidum. (*O. R.* 1895, 288.) A pale-coloured variety. (E. Pynaert, Ghent.)

Cypripedium daviesianum. (*G. C.* 1895, xvii., 82.) A garden hybrid between *C. Boxalli atratum* and *C. Argus.* (T. Statter.)

Cypripedium donatianum. (*B. T. O.* 1895, 79.) A garden hybrid, the parents of which are not given.

Cypripedium fordianum. (*G. C.* 1895, xvii., 210.) S. A garden hybrid between *C. Stonei* and *C. callosum.* (F. Sander & Co.)

Cypripedium fowlerianum. (*G. C.* 1895, xvii., 337.) S. A garden hybrid between *C. harrisianum superbum* and *C. bellatulum.* (F. Sander & Co.)

Cypripedium Goweri magnificum. (*G. C.* 1895, xvii., 529.) A garden hybrid between *C. lawrenceanum* and *C. Curtisii.* (F. Hardy.)

Cypripedium hurrellianum. (*O. R.* 1895, 15.) S. A garden hybrid between *C. Argus* and *C. Curtisii.* (C. G. Roebling, New Jersey, U.S.A.)

Cypripedium insigne citrinum. (*G. C.* 1895, xvii., 39.) S. A variety with lemon-yellow segments. (Truffaut, Versailles.)

Cypripedium kimballianum. (*G. C.* 1895, xvii., 800, f. 125; xviii., 154, 265, 292.) S. Supposed to be a garden hybrid between *C. rothschildianum* and *C. dayanum.* (F. Sander & Co.)

Cypripedium lebaudyanum. (*R. H.* 1895, 360.) S. A garden hybrid between *C. lævigatum* and *C. haynaldianum.* (R. Lebaudy, Bougival, France.)

Cypripedium leeanum virginale. (*G. C.* 1895, xvii., 82.) S. The dorsal sepal is almost entirely pure white. (F. Sander & Co.)

Cypripedium leopoldianum (*G. C.* 1895, xvii., 333.) S. A garden hybrid between *C. leeanum superbum* and *C. insigne Wallacei.* (J. Hye, Ghent.)

Cypripedium littleanum. (*G. C.* 1895, xviii., 36; *O. R.* 1895, 209.) A supposed natural hybrid between *C. lawrenceanum* and *C. dayanum.* (H. Little.)

Cypripedium loochristianum. (*G. C.* 1895, xvii., 100.) A garden hybrid between *C. Hookeræ* and *C. harrisianum.* (Ch. Vuylsteke, Ghent.)

Cypripedium Louisæ. (*O. R.* 1895, 50.) S. A garden hybrid, probably between *C. leeanum* and *C. Ashburtoniæ.* (R. le Doux.)

Cypripedium Masonii. (*G. C.* 1895, xvii., 800.) S. A garden hybrid between *C. Stonei* and *C. spicerianum.* (H. Low & Co.)

Cypripedium Millmani. (*G. C.* 1895, xvii., 800.) S. A garden hybrid between *C. lawrenceanum* and *C. philippinense.* (A. J. Hollington.)

Cypripedium pavonium. (*G. C.* 1895, xvii., 210.) S. A garden hybrid between *C. Boxalli* and *C. venustum.* (W. L. Lewis & Co.)

Cypripedium pendulum. (*G. C.* 1895, xviii., 192.) A garden hybrid between *C. Argus Moënsii* and *C. philippinense.* (Heath & Son.)

Cypripedium picturatum. (*G. C.* 1895, xviii., 326.) A garden hybrid between *C. spicerianum* and *C. superbiens.* (Sir Trevor Lawrence.)

Cypripedium platycolor. (*G. C.* 1895, xviii., 655.) S. A garden hybrid between *C. Stonei platytænium* and *C. concolor.* (Sir T. Lawrence.)

Cypripedium refulgens. (*G. C.* 1895, xvii., 210, 338.) S. A garden hybrid between *C. Curtisii* and *C. hirsutissimum.* (C. L. N. Ingram.)

Cypripedium rossianum. (*O. R.* 1895, 359.) A garden hybrid between *C. barbatum* and *C. tonsum.*

Cypripedium signatum. (*Bull Cat.* 1895, 7.) A garden hybrid between *C. spicerianum* and *C. villosum.* (W. Bull.)

Cypripedium Smithii. (*G. C.* 1895, xviii., 152.) S. A garden hybrid between *C. lawrenceanum* and *C. ciliolare.* (C. G. Roebling, New Jersey, U.S.A.)

Cypripedium suffusum. (*G. C.* 1895, xvii., 210.) S. A garden hybrid between *C. lawrenceanum* and *C. venustum?* (W. L. Lewis & Co.)

Cypripedium uihleinianum. (*Sand. Cat.* 1895, 10.) A garden hybrid between *C. Curtisii* and *C. spicerianum.* (F. Sander & Co.)

Cypripedium Vanneræ. (*G. C.* 1895, xvii., 402; *O. R.* 1895, 144.) S. A garden hybrid between *C. selligerum majus?* and *C. Curtisii.* (De B. Crawshay.)

Cypripedium vigerianum. (*R. H.* 1895, 359; *G. C.* 1895, xviii., 100.) S. A garden hybrid between *C. barbatum* and *C. superciliare.* (Mantin, France.)

Cypripedium wallaertianum. (*G. C.* 1895, xviii., 655.) S. A garden hybrid between *C. harrisianum* and *C. villosum.* (J. W. Swinburne.)

Cypripedium warnhamiense. (*G. C.* 1895, xviii., 248.) S. A garden hybrid between *C. philippinense* and *C. Curtisii.* (J. Veitch & Sons.)

Cypripedium whitelyanum. (*G. C.* 1895, xviii., 307.) S. A garden hybrid between *C. Boxalli atratum* and *C. lawrenceanum.* (H. Shaw.)

Cypripedium wolterianum, Kränzlin. (*G. C.* 1895, xvii., 166.) A new species allied to *C. Lowii,* which it resembles in general appearance, but differs principally in its smaller inferior sepal, in the colour of the basal part of the petals, in its entirely different staminode, and in its smoothness. Habitat unrecorded. (M. T. Wolter, Magdeburg.)

Cypripedium youngianum. (*R. H.* 1895, 360.) A garden hybrid. (R. Lebaudy, Bougival, France.)

Cypripedium Yvonnæ. (*Ill. H.* 1895, t. 26.) A variety of *C. leeanum,* not unlike that known as *giganteum.*

Cyrtopodium flavescens, Cogn. (*L.* x., 84.) Orchideæ. S. Allied to *C. Andersoni.* Flowers produced before the leaves; scape 3 ft. high, bearing numerous yellow flowers. Venezuela. (L'Horticulture Internationale, Brussels.)

***Cyrtopodium virescens**, Rchb. f. (*B. M.* t. 7396.) S. Pseudo-bulbs, tufted, fusiform 4 in. long; leaves 1 ft. long, 1 in. broad plicate; scape 4 ft. high, the upper half clothed with flowers 1 in. in diameter and coloured pale yellow blotched with red. Brazil. (Kew.)

***Davallia tenuifolia Burkei.** (*G. C.* 1895, xviii., 102.) Filices. S. A pendent variety, suitable for baskets. New Guinea. (J. Veitch & Sons.)

Davallia truffautiana. (*Ill. H.* 1895, 186.) S. "A handsome fern with finely-cut fronds." Peru. (L'Horticulture Internationale, Brussels.)

Dendrobium Astræa. (*O. R.* 1895, 167.) Orchideæ. S. A garden hybrid between *D. luteolum* and *D. crassinode.* (N. C. Cookson.)

Dendrobium curviflorum, Rolfe. (*K. B.* 1895, 281.) S. A new species of the section *Aporum.* Stems 6 in. long; leaves lanceolate $1\frac{1}{2}$ in. long; flowers solitary, axillary, $1\frac{3}{4}$ in. long, white suffused with pink, the lip blotched with yellow. Himalaya. (J. O'Brien.)

Dendrobium Donnesiæ. (*G. C.* 1895, xvii., 402.) A supposed natural hybrid between *D. formosum* and *D. infundibulum.* (J. Bradshaw.)

Dendrobium Edithæ. (*G. C.* 1895, xvii., 337.) A garden hybrid between *D. aureum* and *D. nobile nobilius.* (J. Veitch & Sons.)

Dendrobium euosmum virginale. (*G. C.* 1895, xvii., 337.) A garden hybrid between *D. endocharis* and *D. nobile intermedium.* (J. Veitch & Sons.)

Dendrobium gemma. (*O. R.* 1895, 73.) S. A garden hybrid between *D. aureum* and *D. superbum Huttoni.* (C. Winn.)

Dendrobium glomeriflorum, Kränzlin. (*G. C.* 1895, xviii., 206.) A new species with small and insignificant pale rosy flowers in dense clusters of one to five on each stem. Habitat not recorded. (F. Sander & Co.)

Dendrobium illustre. (*O. R.* 1895, 243; *J. of H.* 1895, xxx., 561, f. 99.) A garden hybrid between *D. chrysotoxum* and *D. dalhousieanum.* (J. Veitch & Sons.)

Dendrobium inflatum, Rolfe. (*K. B.* 1895, 6.) S. A new species of the section *Pedilonium.* Pseudo-bulbs slender, 6 in. long; leaves 1 in. long; racemes short, few flowered; flowers 1 in. long, white with a yellow blotch on the lip. Java. (L'Horticulture Internationale, Brussels.)

Dendrobium Murrayi. (*O. R.* 1895, 167.) S. A garden hybrid between *D. nobile* and *D. albosanguineum.* (N. C. Cookson.)

Dendrobium nobile candidulum. (*L.* x., 480.) A variety with white sepals and petals; lip purple, margined with white. (L'Horticulture Internationale, Brussels.)

Dendrobium owenianum. (*G.C.* 1895, xvii., 168.) A garden hybrid between *D. linawianum* and *D. wardianum.* (J. Chamberlain.)

Dendrobium Phalænopsis hololeuca. (*G. C.* 1895, xviii., 192, 396, f. 72.) A variety with pure white flowers. (J. T. Holmes.)

***Dendrobium robustum,** Rolfe. (*K. B.* 1895, 33.) S. Allied to *D. mirbelianum,* but with less acute segments and smaller bracts. Pseudo-bulbs 2 ft. long; flowers yellowish-green with purple lines. New Guinea. (F. Sander & Co.)

***Dendrobium sanguineum,** Rolfe. (*G. C.* 1895, xviii., 292.) A new species belonging to the section *Clavipes* with slender stems 3 ft. long and axillary small crimson flowers. Borneo. (H. Low & Co.)

***Dendrobium speciosissimum,** Rolfe. (*O. R.* 1895, 119.) S. Allied to *D. formosum.* Pseudo-bulbs 5–6 ft. high; flowers as in *D. formosum,* but with a deep orange-red blotch on the lip. Borneo. (H. Low & Co.)

Dendrobium velutinum, Rolfe. (*K. B.* 1895, 34.) S. Pseudo-bulbs 5 in. long, fusiform; leaves lanceolate, 3 in. long; raceme 1 in. long; flowers like those of *D. cariniferum,* deep yellow; lip velutinous. Burma. (Charlesworth & Co.)

Dendrobium versicolor, Cogn. (*J. O.* 1895, 153.) Allied to *D. megaceras;* sepals at first greenish-yellow, afterwards changing to a good yellow tinged with purple externally; petals at first a pale green, afterwards sulphur-yellow; lip passes from a greenish colour into very pale yellow. Assam. (L'Horticulture Internationale, Brussels.)

Dendrobium xanthocentrum. (*G. C.* 1895, xvii., 82.) S. A garden hybrid between *D. Ainsworthii* and *D. findlayanum.* (Sir Trevor Lawrence.)

Disa sagittalis, Sw. (*B. M.*, t. 7403.) Orchideæ. A tuberous rooted species with short strap-shaped green leaves and an erect scape 8 in. high, bearing a raceme of about a dozen white and blue flowers, $\frac{3}{4}$ in. long. South Africa. (H. J. Elwes.)

***Echinocactus aureus.** (*G. C.* 1895, xvii., 800.) Cacteæ. G. A garden name for an unflowered cactus with short stems and bright yellow spines ½ in. long. (Sander & Co.) [This is probably *E. Grusoni.*]

***Episcia densa,** Wright. (*K. B.* 1895, 17.) Gesneriaceæ. S. Allied to *E. erythropus*. Stem short; leaves oblong purplish; flowers axillary, corolla cylindrical, 1½ in. long, yellow tinged with purple. British Guiana. (Kew.)

Eulophia congoensis, Cogn. (*L.* xi., t. 496.) Orchideæ. S. A plant very nearly allied to, if not specifically identical with, *E. guineensis*, Lindl. Congo. (L'Horticulture Internationale, Brussels.)

***Eulophia deflexa,** Rolfe. (*K. B.* 1895, 192.) S. Allied to *E. barbata*. Leaves lanceolate about 1 ft. long; scape 2 ft. long bearing a lax raceme of purple and lilac flowers 2 in. across, the lip fringed with white. Natal. (Kew.)

Euphorbia Fournieri. (*Ill. H.* 1895, 190.) Euphorbiaceæ. S. "A pretty decorative plant with a profusion of small white flowers." Madagascar. (Sallier-Joanni, Paris.)

Fedia Cornucopiæ candidissima, Sprenger. (*B. T. O.* 1895, 19.) Valerianeæ. H. A form differing from the type in having white flowers. (Dammann & Co., Naples.)

Felicia abyssinica, Sch. Bip. (*W. G.* 1895, 439, f. 43.) Compositæ. H. H. A dwarf tufted species with lilac flower-heads like those of *Aster alpinus*. Tropical Africa. (Dammann & Co., Naples.)

***Fritillaria kotschyana affinis.** (*Gard.* 1895, xlvii., 298.) Liliaceæ. H. Like *F. aurea* in size and shape, dark crimson outside and lighter with yellow markings inside. (Max Leichtlin, Baden.) [This is *F. nobilis*, Baker.]

***Gentiana Kurro brevidens.** (*J. of H.* 1895, xxx., 3.) Gentianeæ. H. A variety with a dwarf spreading habit. Flowers blue, borne on prostrate stems 3-5 in. long. Himalaya. (Kew.)

Gentiana saxosa, Forst. (*Gard.* 1895, xlviii., 141.) H. H.? A handsome little species in the way of *G. acaulis*. Flowers white, borne in umbels of 4–5. New Zealand. (Correvon, Geneva.)

Geonoma tenuifolia. (*Ill. H.* 1895, 186.) Palmeæ. S. A palm with leaves like those of *G. gracilis*, but glaucous, and the young foliage tinted with rose. Eastern Peru. (L'Horticulture Internationale, Brussels.)

***Graptophyllum picturatum.** (*Bull Cat.* 1895, 7.) Acanthaceæ. S. A form of the well-known *G. pictum*, with larger leaves than the type. (W. Bull.)

***Heliconia illustris rubricaulis.** (*Sand. Cat.* 1895, 33.) Scitamineæ. S. Differs from the type (see *K. B.* 1893, App. II. p. 41) in having more richly coloured leaves and the sheathing bases of the leaf-stalks coloured vermilion-red. (F. Sander & Co.)

***Hemerocallis aurantiaca major,** Baker. (*G. C.* 1895, xviii., 62, f. 80; *Gard.* 1895, xlviii. 400, t. 1041.) Liliaceæ. A variety with large bright orange-red flowers, which are produced in autumn; leaves 1½ in. wide, and strongly ribbed. Japan. (Wallace & Son.)

***Heptapleurum venulosum erythrostachys,** Hook. f. (*B. M.* t. 7042.) Araliaceæ. S. A small tree with spreading branches and digitate long-stalked leaves; flowers red, minute, very numerous on a branched terminal panicle. Tropical Asia. (Kew.)

Hibiscus crassinervius flammea. (*B. T. O.* 1895, 20, f. 2.) Malvaceæ. G. A variety with bright red flowers. Abyssinia. (Dammann & Co., Naples.)

Hibiscus micranthus roseus, Sprenger. (*B. T. O.* 1895, 20, f. 3.) A variety with handsome rose-coloured flowers. Abyssinia. (Dammann & Co., Naples.)

Hippeastrum equestre splendens, André. (*R. H.* 1895, 577, t.; *G. M.* 1895, 264.) Amaryllideæ. S. A variety differing from the type in the broader segments and larger size of the flowers, &c. (Truffaut, Versailles.)

Hippeastrum Wolteri, Wittm. (*Gfl.* 1895, 201, f. 49, 466, t. 1418.) S. A variety of the well-known *H. equestre*. Costa Rica. (Wolter, Magdeburg-Wilhelmstadt.)

Huernia macrocarpa, Schweinf. (*Gfl.* 1895, 353, t. 1416.) Asclepiadeæ. A Stapelia-like plant with shortly bell-shaped greenish-yellow flowers spotted with red. Abyssinia. (Berlin B. G.)

Humulus japonicus lutescens. (*B. T. O.* 1895, 207.) Urticaceæ. H. This differs from the type in having the leaves bronzy or gold tinted. (Dammann & Co., Naples.)

Iris asiatica. (*G. M.* 1895, xxxviii., 353, 440, f. 5937.) Irideæ. H. Closely allied to *I. germanica*, but larger in flower. Standards grey-blue, with falls of a rich bluish-purple and yellow and brown veins. Asia Minor. (Wallace & Co.)

Iris Cosniæ. (*Gard.* xlvii., 351.) H. A dwarf Iris with large flowers. Standards clear yellow with dark purple markings, the falls of the same shade pencilled with purple. (T. S. Ware.)

***Iris Delavayi,** Micheli. (*R. H.* 1895, 398, ff. 128–9.) H. A tall growing Iris nearly allied to *I. sibirica;* flowers a beautiful violet colour blotched with white. Yunnan. (Micheli, Geneva.)

Iris Parkor. (*G. C.* xvii. 612.) H. A garden hybrid between *I. paradoxa* and *I. Korolkowi.* (Prof. M. Foster.)

***Ixianthes retzioides,** Benth. (*B. M.* t. 7409.) Scrophularineæ. G. A branching leafy shrub, 7 ft. high; leaves crowded, 4 in. long, ⅓ in. broad, pubescent; flowers on short axillary peduncles, yellow, tube inflated, nearly an inch long, limb 5-lobed, spreading. South Africa. (Kew.)

Kalmia cuneata, Michx. (*G. and F.* 1895, 434, f. 60.) Ericaceæ. H. A deciduous shrub with slender straggling stems 2–3 ft. high; flowers ¾ in. in diameter, creamy white with a broad light red band at the base of the limb. North Carolina. (Biltmore Arboretum, North Carolina.)

***Kickxia africana,** Benth. (*K. B.* 1895, 241; *Hook. Ic. Plant,* t. 1276.) Apocynaceæ. S. A large tree, 60 ft. high; leaves oblong-lanceolate 4–9 in. long; flowers numerous on short axillary cymes, salver-shaped, yellow, including the lobes about 1 in. long. A valuable "rubber" tree. West Trop. Africa. (Kew.)

***Kniphofia Woodii.** (*Gard.* 1895, xlviii., 292.) Liliaceæ. H. A new species which resembles *K. modesta* in general characters, but is stouter, and the leaves have marginal spines. Scape 3½ ft. high. Flower-heads 9 in. long, cream-yellow. Natal. (Kew.)

Lælia anceps crawshayana. (*J. of H.* 1895, xxx., 67, f. 12.) Orchideæ. G. A giant form with broad petals and rich colours. (De B. Crawshay.)

Lælia anceps lineata. (*G. C.* 1895, xviii., 734.) G. Differs from the type in having sepals white and crimson with brown lines. (Lord Rothschild.)

Lælia flammea. (*G. C.* 1895, xvii., 168.) G. A garden hybrid between *L. cinnabarina* and *L. Pilcheri.* (J. Chamberlain.)

Lælia flava aurantiaca. (*G. C.* 1895, xvii., 468.) G. A variety with flowers of a glowing pure orange colour. (Lord Rothschild.)

Lælia harpophylla Claudii. (*G. C.* 1895, xvii., 210.) G. A variety with broad segments of a rich orange-scarlet colour. (W. L. Lewis & Co.)

Lælia purpurata enfieldensis. (*G. C.* 1895, xvii., 662.) G. A very large and richly coloured form. (H. Low & Co.)

Lælia purpurata albanensis. (*G. C.* 1895, xvii., 580.) G. A variety with broad white segments and a deep purple lip. (Sander & Co.)

Lælio-Cattleya Amesiæ. (*G. C.* 1895, xviii., 455.) Orchideæ. G. A garden hybrid between *Lælia crispa* and *Cattleya maxima.* (T. Statter.)

Lælio Cattleya andreana. (*R. H.* 1895, 401; *G. C.* 1895, xviii., 293.) G. A garden hybrid between *Cattleya bicolor* and *Lælia elegans.* (M. L. Farnier, Marseilles.)

Lælio-Cattleya brymeriana. (*G. C.* 1895, xviii., 338.) G. A garden hybrid between *L.-C. Amanda* and *C. Warcewsiczii.* (W. E. Brymer.)

Lælia-Cattleya canhamiana. (*R. H.* 1895, 359.) G. A garden hybrid between *Cattleya Mossiæ* and *Lælia purpurata.* (Baron E. de Rothschild, Armainvilliers, France.)

Lælio-Cattleya darwiniana. (*O. R.* 1895, 293.) G. A garden hybrid between *L.-C. elegans* and *Cattleya maxima.* (C. Ingram.)

Lælio-Cattleya elsteadensis. (*O. R.* 1895, 293.) G. A garden hybrid between *L. xanthina* and *Cattleya bicolor.* (C. Ingram.)

Lælio-Cattleya Fortuna. (*G. C.* 1895, xviii., 467.) G. A garden hybrid between *Lælia elegans alba* and *Cattleya Mossiæ.* (J. Veitch & Sons.)

Lælio - Cattleya gottoiana rosea. (*G. C.* 1895, xviii., 467.) G. A supposed natural hybrid between *Lælia tenebrosa* and *Cattleya labiata.* (F. Sander & Co.)

Lælio-Cattleya hardyana. (*G. C.* 1895, xviii., 248.) G. A garden hybrid between *Cattleya Gigas* and *Lælia purpurata.* (F. Hardy.)

Lælio - Cattleya Harrisii. (*G. C.* 1895, xvii., 748.) G. A garden hybrid between *Lælia schilleriana* and *Cattleya Mossiæ.* (Miss Harris.)

Lælio-Cattleya jacobiana. (*R. H.* 1895, 359.) G. A garden hybrid between *Cattleya Mendelii* and *Lælia purpurata.* (Baron E. de Rothschild, Armainvilliers, France.)

Lælio-Cattleya Sallieri. (*R. H.* 1895, 511.) G. A garden hybrid between *Lælia purpurata*, var. *Williamsi* and *Cattleya Loddigesii*. (Ch. Maron, Marseilles.)

Lælio-Cattleya sayana, L. Lind. (*L.* t. 463.) G. A dark variety of *L.-C. elegans*.

Lælio-Cattleya schulziana. (*L.* xi., t. 489.) G. A garden hybrid between *Lælio-Cattleya elegans* and *Cattleya labiata*. (L'Horticulture Internationale, Brussels.)

Lælio-Cattleya trentonense. (*O. R.* 1895, 15.) G. A garden hybrid between *Cattleya elegans* and *Laelia pumila*. (R. M. Gray.)

Lælio - Cattleya varjenevskyana. (*L.* t. 466.) G. A garden hybrid between *Lælia grandis* and *Cattleya Warneri*. (L'Horticulture Internationale, Brussels.) [Identical with L.-C. albanensis, *see O. R.* 1895, 164.]

Lamourouxia Pringlei, Rob. (*G. and F.*, 1895, 273, f. 39.) Scrophularineæ. G. A much branched, erect shrub, 3–5 ft. high, with small, ovate, sessile leaves, and tubular bi-labiate flowers, 1½ in. long, crimson. Mexico.

Lathyrus pubescens, Hook & Arnott. (*G.C.* xvii., 112.) Leguminosæ. H. H. A climber with unequally pinnate leaves, which are downy like the stem. Flowers, pale violet, in dense racemes. Hardy in the south of France. Uruguay. (Ed. André, Paris.)

Leptosyne gigantea, Kellogg. (*W. G.* 1895, 441, ff. 46–7; *Gfl.* 1895, 592, ff. 111–2.) Compositæ. H. H. A tall plant with finely divided leaves and a fleshy-woody stem from 2–8 ft. in height. Flower-heads resembling those of a small sunflower. California. (Haage & Schmidt, Erfurt.)

Licuala kirsteniana, Hort. (*Ill. H.* 1895, 189.) Palmeæ. S. "A pretty palm with deeply-cut leaves." Madagascar. (F. Sander & Co.)

Lilium Beerensi. (*Gard.* 1895, xlviii., 11.) Liliaceæ. H. A garden hybrid between *L. chalcedonicum* and *L. excelsum*. (T. Ware.)

Lueddemannia triloba, Rolfe. (*K. B.* 1895, 283; *G. C.* 1895, xviii., 588.) Orchideæ. S. Pseudo-bulbs ovoid 2½ in. long. Leaves lanceolate 1 ft. long. Scape pendulous, 6 in. long; flowers numerous, yellow, with a few madder-brown blotches on the lip. South America. (Sir Trevor Lawrence.)

Luisia Cantharis, Rolfe. (*K. B.* 1895, 193.) Orchideæ. S. Allied to *L. volucris*. Stem elongate; leaves terete, 6 in. long; raceme very short; flowers 1 in. across, green and purple, the lip resembling a small beetle. Burma. (H. Low & Co.)

Lycaste ayeriana. (*G. C.* 1895, xviii., 49.) Orchideæ. S. A species with the habit of *Cattleya citrina*, but with angular pseudo-bulbs, strap-shaped glaucous green leaves, and drooping, green flowers. Peru. (Sander & Co.)

Mahonia moseriana. (*Jard.* 1895, 128.) Berberideæ. H. A variety of *Berberis Aquifolium* with light green leaves tinged with coppery red. (Moser, Versailles.)

Marica northiana splendens, Cogn. (*Ill. H.* 1895, t. 40.) Irideæ. G. A variety with flowers more brightly coloured than the type. Brazil. (L'Horticulture Internationale, Brussels.)

Masdevallia eclyptrata, Kränzlin. (*G. C.* 1895, xviii., 577.) Orchideæ. A new species somewhat resembling *M. cucullata*, with rich orange-yellow flowers. Habitat not recorded. (Berlin B. G.)

Masdevallia falcata. (*G. C.* 1895, xvii., 294.) G. A garden hybrid between *M. veitchiana* and *M. Lindenii*. (S. Courtauld.)

Masdevallia forgetiana, Kränzl. (*G. C.* 1895, xviii., 484.) A new species with comparatively narrow bright green leaves and small flowers. Northern Brazil. (F. Sander & Co.)

Masdevallia Heathii. (*G. C.* 1895, xvii., 594.) A garden hybrid between *M. veitchiana* and *M. ignea superba*. (F. Sander & Co.)

Masdevallia Lawrencei, Kränzlin. (*G. C.* 1895, xviii., 324, 388.) A synonym of *M. guttulata*, Rchb. f.

Masdevallia Leda. (*O. R.* 1895, 203.) A garden hybrid between *M. Estradæ* and *M. Arminii*. (Captain Hinks.)

Masdevallia tovarensis mooreana. (*O. R.* 1895, 7.) Differs from the type in having the tails of the sepals coloured orange-red. (F. Sander & Co.)

Maxillaria mooreana, Rolfe. (*K. B.* 1895, 36.) Orchideæ. G. Allied to *M. grandiflora*. Flowers cream-coloured with maroon-purple stripes on each petal and a farinaceous lip, margined with purple. Guatemala. (F. Sander & Co.)

***Maxillaria parva,** Rolfe. (*K. B.* 1895, 193.) G. Allied to *M. pumila.* Pseudo-bulbs small; leaves 1 in. long; flowers yellow, borne on a short scape. Brazil. (Kew.)

***Maxillaria sanguinea,** Rolfe. (*K. B.* 1895, 8.) S. Allied to *M. tenuifolia* which it resembles in habit, differing in having dull red-brown and yellow flowers with a purple-crimson lip. Chiriqui. (Kew.)

Megaclinium imschootianum, Rolfe. (*K. B.* 1895, 8.) Orchideæ. S. Allied to *M. oxypterum,* the flowers are less crowded; leaves 6 in. long; scape 10 in. long; flowers small, yellowish-green with brown spots. Tropical Africa? (Van Imschoot, Ghent.)

Miconia vesicaria. (*Ill. H.* 1895, 187.) Melastomaceæ. S. Leaves ciliated, ovate, about 6 in. long, ground colour deep green shaded with violet. Peru. (L'Horticulture Internationale, Brussels.)

***Microstylis macrochila,** Rolfe. (*K. B.* 1895, 6; *G. C.* 1895, xviii., 325, f. 60.) Orchideæ. S. The largest flowered species yet known. The leaves are almost identical with those of *M. Scottii,* their colour light brown with a marginal band of light yellow; scape 8 in. long; lip ½ in. wide. Malaya. (Sir Trevor Lawrence.)

Mimulus Clevelandi, Brandegee. (*G. and F.* 1895, 134, f. 20.) Scrophularineæ. G. A perennial, suffrutescent at base, with glandular-pubescent, lanceolate, serrate leaves and golden-yellow flowers. Southern California.

***Musa kewensis.** (*G. C.* 1895, xviii., 516.) Scitamineæ. A garden hybrid between *M. Mannii* and *M. rosacea.* The first recorded hybrid Musa of garden origin. (Kew.)

***Musa rubra,** Wall. (*B. M.* t. 7451.) S. Allied to *M. coccinea.* Stems 7 ft. high, slender. Leaves 6 ft. long, spike erect, bracts boat-shaped, rose-red, with yellow tips; flowers 1½ in. long, pale yellow. Fruit 3 in. long,trigonous, many-seeded. Pegu. (Kew.)

Narcissus cyclamineus-Horsfieldi. (*G. C.* 1895, xvii., 468.) Amaryllideæ. H. A garden hybrid between the two species indicated in the name. (G. H. Engelheart.)

Nepenthes formosa. (*Veitch Cat.* 1895, 8.) Nepenthaceæ. S. A garden hybrid between *N. Chelsoni* and *N. distillatoria.* (J. Veitch & Sons.)

Nerine Alleni. (*G. C.* 1895, xviii., 526.) Amaryllideæ. A garden hybrid between *N. corusca major* and *N. sarniensis.* (R. H. Allen, Guernsey.)

Nidularium Chantrieri. (*R. H.* 1895, 452, t.) Bromeliaceæ. S. A garden hybrid between *N. fulgens* and *N. Innocenti* (Chantrier frères, France.)

Nidularium paxianum, Mez. (*Gfl.* 1895, 297, t. 1415.) S. Nearly allied to *N. Innocentii,* but with peculiar yellow-green leaves; bracts red-tipped; flowers white. Brazil. (Dr. Schenk, Bonn.)

Notylia brevis, Rolfe. (*K. B.* 1895, 194.) Orchideæ. G. Allied to *N. macrantha.* Leaves oblong, 4 in. long; raceme short, many-flowered; flowers minute, white and yellow. South America. (Sir Trevor Lawrence.)

Nymphæa omarana. (*G. and F.* 1895, 96.) Nymphæaceæ. S. A garden hybrid between *N. dentata* and *N. Sturtevantii.* (G. G. Hubbard, Washington, U.S.A.)

Odontoglossum andersonianum Marshalli. (*O. R.* 1895, 167.) Orchideæ. G. Differs from the type in having violet-purple spots on the flower segments. (G. Marshall.)

Odontoglossum andersonianum pulvereum. (*G. C.* 1895, xvii., 81.) G. A variety with yellow flowers, closely set with small red spots. (De B. Crawshay.)

Odontoglossum aspersum violaceum. (*G. C.* 1895, xvii., 468.) A variety with buff-tinted sepals and petals spotted with red-brown, and purplish lips. (Sir Trevor Lawrence.)

Odontoglossum aspidorhinum, Lehm. (*G. C.* 1895, xviii., 358.) A new species with long-ovoid pseudo-bulbs, stiff cuneate-oblong leaves, and flowers of a clear yellow, blotched more or less with red-brown. (F. C. Lehmann, Popayan, U. S. Colombia.)

Odontoglossum crispum luteo-radiatum. (*L.* xi., t. 492.) G. A variety having a central band of yellow in the sepals, petals and lip. (L'Horticulture Internationale, Brussels.)

Odontoglossum Halli-xanthum. (*L.* x., t. 467.) A supposed natural hybrid between *O. Halli* and *O. polyxanthum.* Equatorial Andes. (L'Horticulture Internationale, Brussels.)

Odontoglossum harvengtense. (*L.* x., t. 478; *J. O.* v., f. 7.) A hybrid between *O. crispum* and *O. sceptrum.* (L'Horticulture Internationale, Brussels.)

Odontoglossum wilckeanum Dobbelaeræ. (*O. R.* 1895, 16.) G. Flowers clear canary-yellow with a few cinnamon spots, segments broader than in the type. (M. P. Dobbelaere, Ghent.)

Oncidium dichronum, Rolfe. (*O. R.* 1895, 363.) Orchideæ. A near ally of *O. aureum*, with which it has hitherto been confused, but the flowers are larger, the sepals and petals reddish-purple and the lip bright yellow. The panicles are branched. Peru. (F. Sander & Co.)

Oncidium Gardneri flavescens. (*O. R.* 1895, 270.) Flowers yellowish, unspotted. (W. Bull.)

Oncidium panduratum, Rolfe. (*K. B.* 1895, 9.) G. Allied to *O. anthocrene*, but with smaller and more numerous flowers coloured red-brown and yellow. Colombia. (W. S. Ellis.)

***Opuntia fulgida,** Engelm. (*G. and F.* 1895, 324, f. 46.) Cacteæ. G. An arboreal species attaining a height of 15 ft. and branching freely. Joints short, ovate cylindrical, very spiny, spines 1 in. long; flowers small, bright pink fading to purple. Arizona.

Panicum tonsum, Steud. (*B. T. O.* 1895, 254.) Gramineæ. H. A graceful perennial species with a light feathery silvery inflorescence. S. Africa. (Dammann & Co., Naples.)

***Pelexia saccata,** Rolfe. (*K. B.* 1895, 195.) Orchideæ. S. Allied to *P. maculata*. Leaves ovate, 6 in. long, 2 in. wide, light green, prettily marbled with grey. Raceme 6 in. long, flowers small, green with a whitish lip. Guatemala. (F. Sander & Co.)

Pentstemon Gordoni, Hook. **splendens.** (*Gfl.* 1895, 77, f. 25.) Scrophularineæ. A hardy perennial with rosette of spathulate leaves and tall inflorescence of dark blue flowers. N. America. (Haage & Schmidt, Erfurt.) [The correct name of *P. Gordoni*, Hook., is *P. glaber*, Pursh.]

Phaio-Calanthe berryana. (*G. C.* 1895, xviii., 655. Orchideæ. S. A garden hybrid between *P. Humblotii* × *C. masuca*. (F. Sander & Co.)

Phaius Cooksoniæ. (*O. R.* 1895, 220; *G. and F.* 1895, 274.) Orchideæ. S. A garden hybrid between *P. Humblotii* and *P. grandifolius*. (N. C. Cookson.)

Phaius Roeblingii, J. O'Brien. (*G. C.* 1895, xvii., 358.) S. A new species with pseudo-bulbs 10 in. long, leaves 4 ft. long, and reddish Indian-yellow fragrant flowers 5 in. across. Khasia Hills. (C. G. Roebling, New Jersey.)

Phalænopsis Lindeni, Loher. (*G. C.* 1895, xviii., 36.) Orchideæ. A new species with flowers closely resembling *P. rosea*, but much larger; leaves somewhat like those of *P. schilleriana*. (L'Horticulture Internationale, Brussels.)

Phalænopsis ludde-violacea. (*G. C.* 1895, xviii., 102.) S. A garden hybrid between *P. luddemanniana* and *P. violacea*. (J. Veitch & Sons.)

Philodendron devansayanum. (*Ill. H.* 1895, 187, 376, t. 48.) Aroideæ. S. Stems scandent; leaves cordate, glossy green when adult and blood-red when young; the stems are also red. Upper Peru. (L'Horticulture Internationale, Brussels.)

Philodendron Martineti. (*Ill. H.* 1895, 223.) S. This resembles very closely *P. Melinoni*. Origin not given. (L'Horticulture Internationale, Brussels.)

Phyllocactus Hildmanni. (*Gfl.* 1895, 634, t. 1421.) Cacteæ. A garden hybrid between *P. Wrayi* and *P. crenatus*. (H. Hildemann, Birkenwerder.)

***Pilea spruceana,** N. E. Br. (*G. C.* 1895, xviii., 388.) Urticaceæ. A dwarf plant with ovate, rugose dark bronzy-green leaves; flowers greenish white, in crowded axillary racemes. Peru and Venezuela. (Glasnevin.)

***Piptospatha Ridleyi,** N. E. Br. (*B. M.* t. 7410.) Aroideæ. S. A new species, differing from *P. insignis* by its larger leaves mottled with yellow, and the peduncle, which is 6 in. long, bearing a nodding spathe 2 in. long, green with pink lines and dots; spadix shorter than the spathe, in which it is completely hidden. Malay Peninsula. (Kew.)

Pleurothallis autraniana, Kränzl. (*O. R.* 1895, 264.) Orchideæ. Allied to *P. longissima*. Flowers in racemes, light yellow spotted and striped with purple-brown. (Madame Boissier, Switzerland.)

Pleurothallis parva, Rolfe. (*K. B.* 1895, 33.) S. A small species with yellow flowers. Brazil. (F. Sander & Co.)

***Pleurothallis rotundifolia,** Rolfe. (*K. B.* 1895, 191.) S. A small species with orbicular leaves, ½ in. long, and short scapes of yellow and purple flowers. Jamaica. (Kew.)

***Polygala Galpini,** Hook. f. (*B. M.* t. 7439.) Polygaleæ. G. A slender straggling shrub 3–5 ft. high. Leaves ovate-acuminate 3 in. long; flowers in

axillary, erect racemes 4 in. long; pedicels $\frac{1}{4}$ in. long, corolla 1 in. rosy-lilac. Swaziland. (Kew.)

***Polystachya Kirkii,** Rolfe. (*K. B.* 1895, 282.) Orchideæ. S. Allied to *P. lawrenceana*. Pseudo-bulbs narrow, 2 in. long. Leaves linear oblong, 5 in. oblong. Scape flattened, 3 in. long, flowers $\frac{1}{2}$ in. across, white, the lip margined with purple. East Trop. Africa. (Kew.)

***Polystachya zambesiaca,** Rolfe. (*K. B.* 1895, 192.) S. A small plant with lanceolate leaves 3 in. long and short scapes of yellow and brown flowers. Tropical Africa. (Kew.)

Polystichum constrictum, (*G. C.* 1895, xviii., 588.) Filices. A "shield" fern of garden origin. (W. Marshall.)

Pommereschea Lackneri, Wittmack. (*Gfl.* 1895, 131, f. 35.) Zinziberaceæ. S. A quick-growing foliage plant much resembling *Phrynium* in habit. Flowers golden yellow. Burma. (Carl Lackner, Steglitz.)

Prunus cerasifera, Ehrh. var. **contorta,** André. (*R. H.* 1895, 201, f. 57.) Rosaceæ. H. A form differing from the type in being more fastigiate in habit and in having the leaves spirally twisted. (Maquerlot & Son, France.)

Pseudotsuga glaucescens, Bailly. (*R. H.* 1895, 88.) Coniferæ. H. A very glaucous form of the Douglas Fir, Pseudotsuga Douglasi. (Sénéclauze, France.)

***Pteris longifolia Mariesii.** (*Veitch Cat.* 1895, 9.) Filices. G. Differs from the type in its shorter fronds and narrower pinnæ. India. (J. Veitch & Sons.)

***Pteris serrulata voluta.** (*Bull Cat.* 1875, 7.) Pinnæ markedly curled, the apex crested. (W. Bull.)

Pyrethrum parthenifolium glaucum. (*B. T. O.* 22, f. 6.) Compositæ. H. A form differing from the type in having glaucous leaves. (Dammann & Co., Naples.)

***Pyrus cratægifolia,** Targ. Tozz. (*B. M.* 1895, t. 7423.) Rosaceæ. H. A bush or small tree with leaves resembling those of *P. torminalis* in outline, but much thinner in texture. Flowers white, showy. Northern Italy. (Kew.)

***Rhododendron ciliicalyx,** Franchet. (*Jard.* 1895, 51, f. 25.) Ericaceæ. G. A species nearly allied to *R. veitchianum*. Yunnan. (Paris B. G.)

***Rhododendron Keiskei,** Maxim. (*G. and F.* 1895, 23.) G. Allied to *R. dahuricum*, but dwarfer in habit, the leaves ovate, 3 in. long; flowers in loose corymbs, 1 in. across, rose-purple. Japan. (Kew.)

***Rhododendron ovatum,** Maxim. (*Veitch Cat.* 1895, 10.) G. A dwarf species first introduced by Fortune in 1844, but afterwards lost. Leaves ovate, shining, $1\frac{1}{2}$ in. long; flowers rose-purple spotted with dark purple. North China. (J. Veitch & Sons.)

Rhus Michauxii, Sargent. (*G. and F.* 1895, 404, f. 55.) Anacardiaceæ. H. A shrub with erect stems two to three feet in height spreading extensively by underground stolons; leaves pinnate. Fruit in pyramidal panicles, bright scarlet, clothed with close silky pubescence. Southern United States. (Biltmore Arboretum, North Carolina.)

Rosa centifolia paestumense, Sprenger. (*B. T. O.* 1895, 165.) Rosaceæ. H. A variety with double or semi-double clear rose-coloured flowers. (Dammann & Co., Naples.)

***Rosa rugosa calocarpa,** Ed. André. (*R. H.* 1895, 446, ff. 148–9.) A garden hybrid between *R. indica* and *R. rugosa*. (Bruant, Poitiers.)

Ruellia makoyana, Closon. (*R. H. B.* 1895, 109, t.) Acanthaceæ. S. Leaves olive-green shaded with violet and veined with white on the upper surface, the under surface vinous purple; flowers large, carmine-rose. Brazil. (Makoy, Liége, Belgium.)

***Saccolabium bellino - bigibbum,** Rolfe. (*O. R.* 1895, 38.) Orchideæ. S. A natural hybrid between the species indicated in the name. Burma. (Glasnevin.)

***Saccolabium hainanense,** Rolfe. (*K. B.* 1895, 284.) S. Allied to *S. gemmatum*. Stem 6 in. long. Leaves lanceolate linear, $2\frac{1}{2}$ in. long, panicle 6 in. long; flowers numerous, small, white and purple. Hainan. (Kew.)

Sapindus utilis, Trabut. (*R. H.* 1895, 199, 303, ff. 90–92.) Sapindaceæ. G. A tree of interest and value in the Mediterranean region, but useless in this country. (Jardin du Hamma, Algiers.)

Sarcanthus auriculatus, Rolfe. (*K. B.* 1895, 9.) Orchideæ. S. Allied to *S. Parishii*, differing principally in having a pair of ear-like lobes at the base of the lip. The flowers are

greenish-white lined with purple. Habitat not recorded. (J. O'Brien.)

Saxifraga atlantica, Boiss. & Reut. (*W. G.* 1895, 286, f. 25.) Saxifrageæ. H. A compact dwarf-growing plant with light green roundish leaves and slender stems bearing large white scented flowers. Atlas Mountains. (Dammann & Co., Naples.)

Saxifraga globulifera, Desf. (*W. G.* 1895, 284.) This makes a turfy carpet of thickish, divided bright green leaves. During winter and spring the foliage turns purplish-red and forms a good contrast with the white flowers. Atlas Mountains. (Dammann & Co., Naples.)

Scelochilus carinatus, Rolfe. (*K. B.* 1895, 284.) Orchideæ. G. Leaves lanceolate, 4 in. long. Raceme pendulous, short, bearing about seven flowers, sepals ¾ in. long, light yellow, petals ½ in. long, purple and white, lip ½ in. long, white with a purple blotch. South America. (Sir Trevor Lawrence.)

Scelochilus variegatus, Cogn. (*L.* xi., 26.) S. A small orchid with whitish, purple-lined flowers; pseudobulbs flat, very thin; leaves erect or spreading, narrowly lanceolate, 4–5 in. long. Colombia. (L'Horticulture Internationale, Brussels.)

Scilla sibirica multiflora. (*Gard.* 1895, xlviii., 162, t. 1029.) Liliaceæ. H. A floriferous form with longer flower-spikes than the type. (Van Meeuwen, Haarlem.)

Selenipedium dalleanum, Ed. André. (*R. H.* 1895, 164, 548, f. 180 [and coloured plate].) Orchideæ. S. A tall-growing plant with large flowers, the oblong smooth pouch a deep glossy carmine-red. Origin uncertain. (Dallé, Paris.)

Selenipedium finetianum. (*O. R.* 1895, 102.) S. A garden hybrid between *S. cardinale* and *S. caudatum*. (M. F. Finet, Argenteuil.)

***Senecio Hualtata,** Bertero. (*B. M.* t. 7422.) Compositæ. H. A stately herbaceous plant with mostly radical leaves and flowering stems 5 ft. high bearing numerous straw-coloured flower-heads about an inch across. Argentina and Chili. (Kew.)

***Sibthorpia europæa aurea.** (*G. M.* 1895, xxxviii., 305.) Scrophularinæ. A variety with yellow foliage. (Backhouse & Son.)

Sobralia amesiana. (*O. R.* 1895, 203.) Orchideæ. S. A garden hybrid between *S. xantholeuca* and *S. Wilsoni*. (F. Sander & Co.)

Sobralia Lindeni. (*G. and F.* 1895, 444.) Stems shorter than in *S. macrantha*; flowers 10 in. in diameter, the sepals and petals white, tinted with rose, lip crimson-purple in front, the folded portion white with a few chocolate lines in the throat. (J. Lucas.)

Stanhopea bellærensis, (Mantin). (*G. C.* 1895, xviii., 100.) Orchideæ. A garden hybrid between *S. insignis* and *S. oculata*. (Mantin, Orleans.)

***Stapelia longidens,** N. E. Br. (*G. C.* 1895, xviii., 324.) Asclepiadeæ. G. A new species, allied to *S. Woodii*. Stems 6 in. long, 4-angled, the angles with long ascending stout teeth 1 in. long; flowers in sessile cymes, 1½ in. in diameter, greenish-yellow spotted with purple. Delagoa Bay. (Kew.)

***Sternbergia fischeriana,** Roem. (*G. and F.* 1895, 144; *G. C.* 1895, xvii., 390.) Amaryllideæ. H. Differs from *S. lutea* in its habit of flowering in March, instead of in the autumn. The flowers also are not of so dark a shade of yellow. Asia Minor. (Kew.)

***Streptocarpus Dyeri.** (*G. and F.* 1895, 5.) Gesneraceæ. G. A garden hybrid between *S. Dunnii* and *S. Wendlandi*. (Kew.)

Streptocarpus multiflora. (*G. C.* 1895, xviii., 211.) A garden seedling of *S. Rexii* with larger, brighter coloured flowers than the type. (J. Laing & Sons.)

***Talauma Hodgsoni,** Hook. f. (*B. M.* t. 7392.) Magnoliaceæ. G. An erect evergreen tree with shining green leaves from 8 in. to 20 in. long and about 6 in. wide. Flowers solitary, terminal, fragrant, cupped, 6 in. in diameter; outer segments purple, inner white. Himalaya. (Kew.)

Thunia winniana, Hort. (*G. C.* 1895, xvii., 198; *L.* t. 452.) Orchideæ. A magnificent species, having large flowers with rosy-lilac segments and a very deep maroon-coloured plicated lip.

***Tibouchina meiodon,** Stapf. (*K. B.* 1895, 104.) Melastomaceæ. S. A loose shrub 6 ft. high. Leaves ovate, 1 in. long. Flowers in peduncled cymes; corolla ½ in. wide, purple. Brazil. (Kew.)

***Trias vitrina,** Rolfe. (*K. B.* 1895, 282.) Orchideæ. S. A small plant with a creeping rhizome, ovoid one-leaved pseudo-bulbs, the leaves 3 in.

long; flowers solitary on short pedicels, pale green, with a few spots of brown on the lip. Tenasserim. (Kew.)

Tropæolum Leichtlini. (*R. H.* 1895, 381.) Geraniaceæ. H. A garden hybrid between *T. polyphyllum* and *T. edule.* (Max Leichtlin, Baden.)

Tulipa Greigi pulchella. (*B. T. O.* 1895, 352, t. 12.) Liliaceæ. H. Said to be a hybrid between *T. Greigi* and *T. kaufmanniana.* (Dammann & Co., Naples.)

Tulipa kaufmanniana pulcherrima. (*R. H.* 1895, 175.) H. Probably a hybrid between *T. kaufmanniana* and *T. Greigi.* (Max Leichtlin, Baden.)

***Tylophora oculata,** N. E. Br. (*K. B.* 1895, 112.) Asclepiadeæ. S. Stems climbing. Leaves oblong-lanceolate, 3 in. long. Flowers on short umbellate cymes, ½ in. wide, purple. Sierra Leone. (Kew.)

***Veronica amplexicaule,** Armstr. (*G. M.* 1895, xxxviii., 87; *B. M.* 7370.) Scrophularinæ. H. A dwarf shrubby plant, with imbricating elliptic leaves and spikes of white flowers. N. Zealand. (Edinburgh and Kew.)

***Veronica Hectori,** Hook, f. (*G. C.* 1895, xvii., 590; *B. M.* t. 7415.) H. An erect undershrub, with small imbricate leaves, and clusters of pale lilac flowers. New Zealand. (Edinburgh and Kew.)

Vriesia andreana. (*Ill. H.* 1895, 217.) Bromeliaceæ. S. A garden hybrid between *V. Barilleti* and *V. splendens major.* (Léon Duval, Versailles.) [The genus *Vriesia* is now included under *Tillandsia.*]

Vriesia elmireana. (*Ill. H.* 1895, 217.) S. A garden hybrid between *V. cardinalis* and *V. splendens.* (Léon Duval, Versailles.)

Vriesia Henrici. (*Ill. H.* 1895, 217.) A garden hybrid between *V. splendida* and *V. splendens.* (Léon Duval, Versailles.)

Vriesia hybrida petersiana. (*Gfl.* 1895, 456. f. 92.) S. A garden hybrid between *V. guttata* and *V. Barilletii.* (Berlin B. G.)

Vriesia tessellata parisiense. (*Ill. H.* 1895, 189.) S. A fine variety of this ornamental species. (F. Sander & Co.)

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX III.—1896.

LIST of the STAFFS of the ROYAL GARDENS, Kew, and of Botanical Departments and Establishments at Home, and in India and the Colonies, in Correspondence with Kew.

* Trained at Kew. † Recommended by Kew.

Royal Gardens, Kew :—

Director - - -	W. T. Thiselton-Dyer, C.M.G., C.I.E., F.R.S., LL.D., Ph.D., M.A., F.L.S.
Assistant-Director -	Daniel Morris, C.M.G., D.Sc., M.A., F.L.S.
Assistant (Office) . -	*John Aikman.
" " - . -	*William Nicholls Winn.

Keeper of Herbarium and Library	John Gilbert Baker, F.R.S., F.L.S.
Principal Assistant (Phanerogams)	*William Botting Hemsley, F.R.S., F.L.S.
" " (Cryptogams) -	George Massee, F.L.S.
Assistant (Herbarium) - -	Nicholas Edward Brown, A.L.S.
" " - -	*Robert Allen Rolfe, A.L.S.
" " - -	Charles Henry Wright.
" " - -	*Sidney Alfred Skan.
" for India - -	Otto Stapf, Ph.D.

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Honorary Keeper, Jodrell Laboratory	Dukinfield Henry Scott, F.R.S., M.A., Ph.D., F.L.S.

Keeper of Museums	John Reader Jackson, A.L.S.
Assistant (Museum)	John Masters Hillier.
Preparer	George Badderly.

Curator of the Gardens	George Nicholson, A.L.S.
Assistant Curator	William Watson.
Foremen :—	
Arboretum	*William J. Bean.
Herbaceous Department	*Walter Irving.
Greenhouse and Ornamental Department.	Frank Garrett.
Temperate House (Sub-tropical Department).	*William Dallimore.

Cambridge.—University Botanic Garden :—

Professor	Henry Marshall Ward, M.A., Sc.D., F.R.S., F.L.S.
Curator	*Richard Irwin Lynch, A.L.S.

Dublin.—Royal Botanic Gardens, Glasnevin :—

Keeper	Frederick W. Moore, A.L.S.

Trinity College Botanic Gardens :—

Professor	E. Perceval Wright, M.D., F.L.S., Sec. R.I.A.
Curator	*F. W. Burbidge, M.A., F.L.S.

Edinburgh.—Royal Botanic Garden :—

Regius Keeper	Isaac Bayley Balfour, M.D., D.Sc., F.R.S., F.L.S.
Head Gardener	A. D. Richardson.
AssistantGardener	*R. L. Harrow.

Glasgow.—Botanic Gardens :—

University Professor	F. O. Bower, D.Sc., F.R.S., F.L.S.
Curator	*Daniel Dewar.

Oxford.—University Botanic Garden :—

Professor	Sydney H. Vines, D.Sc., F.R.S., F.L.S.
Curator	*William Baker.

COLONIES.

Antigua. (*See* Leeward Islands.)

Barbados.—Dodd's Reformatory, Botanic Station:—

	Superintendent -	John R. Bovell, F.C.S., F.L.S.

British Guiana.—Botanic Gardens:—

Georgetown -	Superintendent and Government Botanist - -	*George S. Jenman, F.L.S.
	Head Gardener -	†John F. Waby.
	Second „ -	*Robert Ward.
	Promenade Garden:—	
	Head Gardener -	William Jackson.
Berbice - -	Keeper - -	Richard Hunt.

British Honduras.—Botanic Station:—

	Curator - -	Eugene Campbell.

Canada.—

Ottawa - -	Dominion Botanist -	Prof. John Macoun, M.A., F.R.S.C., F.L.S.
	Assistant „ -	Jas. M. Macoun.
	Director of Government Experimental Farms - -	Prof. Wm. Saunders, F.R.S.C., F.L.S.
	Botanist and Entomologist.	James Fletcher, F.L.S.
Montreal -	Director, University Botanic Garden.	Prof. D. P. Penhallow, B.Sc.

Cape Colony.—

	Government Botanist -	Prof. MacOwan, F.L.S.

Ceylon.—Department of Royal Botanic Gardens:—

	Director - -	†John C. Willis, M.A.
Peradeniya -	Curator - -	*Hugh McMillan.
	Clerk - -	J. Ferdinandus.
	Draughtsman -	W. de Alwis.
Hakgala -	Superintendent -	*William Nock.
	Clerk and Foreman	M. G. Perera.
Henaratgoda -	Conductor - -	S. de Silva, Arachchi.
Anurâdhapura -	„ - -	D. F. de Silva.
Badulla - -	„ - -	D. A. Guneratne.

Dominica. (*See* Leeward Islands.)

Falkland Islands.—Government House Garden:—

	Head Gardener -	*Albert Linney.

Fiji.—Botanic Station :—

	Curator -	- *Daniel Yeoward.

Gambia.—Botanic Station :—

	Curator -	- *Walter Haydon.

Gold Coast.—Botanic Station :—

	Curator -	- *Charles Henry Humphries.
	Acting Curator	- *Charles Berryman.

Grenada.—Botanic Garden :—

	Curator -	- *Walter E. Broadway.

Hong Kong.—Botanic and Afforestation Department :—

	Superintendent	- †Charles Ford, F.L.S.
	Assistant Superintendent.	*W. J. Tutcher.

Jamaica.—Department of Public Gardens and Plantations :—

	Director -	- †William Fawcett, B.Sc., F.L.S.
Hope Gardens -	Superintendent	- *William Cradwick.
Castleton Garden	"	- *William J. Thompson.
Cinchona (Hill Garden).	"	- *William Harris.
Kingston Parade Garden.	"	- John Campbell.
King's House Garden.	"	- *Thomas J. Harris.
Bath - -	Overseer -	- W. Groves.

Lagos.—Botanic Station :—

	Curator -	- *Henry Millen.
	Assistant -	- *F. G. R. Leigh.
	" -	- *T. B. Dawodu.

Leeward Islands.—Botanic Stations :—

Antigua - -	Curator -	- *Arthur G. Tillson.
Dominica -	" -	- *Joseph Jones.
Montserrat -	Head Gardener	- Henry Maloney.
St. Kitts-Nevis -	" "	- Joseph Wade.

Malta.—Argotti Botanic Garden :—

	Director -	- Dr. Francesco Debono.

Mauritius.—Department of Forests and Botanic Gardens :—

Pamplemousses -	Director -	- *William Scott, F.L.S.
	Assistant Director of Gardens.	J. Vankeirsbilck.
	Overseer -	- J. Powell.
	Assistant Director of Forests.	P. Randabel.
Curepipe - -	Overseer -	- F. Bijoux.
Reduit - -	" -	- W. A. Kennedy.

Montserrat. (*See* Leeward Islands.)

Natal.—Botanic Gardens :—

Durban - -	Curator -	- John Medley Wood, A.L.S.
	Head Gardener	- *James Wylie.
	Propagator	- *William Thorpe.
Pietermaritzburg	Curator -	- G. Mitchell.

New South Wales.—Botanic Gardens:—

Sydney - -	Director - -	J. H. Maiden, F.L.S.

New Zealand:—

Wellington.—Colonial Botanic Garden:—

	Director - -	Sir James Hector, K.C.M.G., F.R.S.
	Head Gardener -	G. Gibb.
Dunedin - -	Superintendent -	J. McBean.
Napier - -	„ -	W. Barton.
Invercargill -	Head Gardener -	Thomas Waugh.
Auckland - -	Ranger - -	William Goldie.
Christchurch -	Head Gardener -	*Ambrose Taylor.

Niger Coast Protectorate.—Botanic Garden:—

Old Calabar -	Curator - -	Horace W. L. Billington.
	Assistant Curator -	*John H. Holland.

Queensland.—Botanic Department:—

Brisbane - -	Colonial Botanist -	F. M. Bailey, F.L.S.

Botanic Gardens:—

	Curator - -	*Philip MacMahon.
	Overseer - -	J. Tobin.

Acclimatisation Society's Gardens:—

	Secretary and Manager	Wm. Soutter.
	Assistant „	A. Humphrey.
Rockhampton -	Superintendent -	J. S. Edgar.

St. Kitts-Nevis. (*See* Leeward Islands.)

St. Lucia.—Botanic Station:—

	Curator - -	*John Chisnall Moore.

St. Vincent.—Botanic Station:—

	Curator - -	*Henry Powell.

Sierra Leone.—Botanic Station:—

	Curator - -	*Frederick Enos Willey.

South Australia.—Botanic Gardens:—

Adelaide - -	Director - -	Maurice Holtze, F.L.S.
Port Darwin -	Curator - -	Nicholas Holtze.

Straits Settlements.—Gardens and Forest Department:—

Singapore -	Director - -	†H. N. Ridley, M.A., F.L.S.
	Assistant Superintendent.	*Walter Fox.
Penang - -	Assistant Superintendent - -	†Charles Curtis, F.L.S.

Perak (Kuala Kangsar).—Government Gardens and Plantations:—

	Superintendent -	Oliver Marks.
„ (Taiping)	„ -	*Robert Derry.

Tasmania.—Botanic Gardens:—

Hobart Town -	Superintendent -	F. Abbott.

Trinidad.—Royal Botanic Gardens:—

	Superintendent -	†John H. Hart, F.L.S.
	Assistant „ -	*William Lunt.

Victoria.—

Melbourne -	Government Botanist	———

Botanic Gardens:—

	Curator -	W. R. Guilfoyle, F.L.S.

INDIA.

Botanical Survey.—Director, George King, M.D., LL.D., C.I.E., F.R.S., F.L.S.

Bengal, Assam, Burma; the Andamans and Nicobars; North-East Frontier Expeditions:—

Superintendent of the Royal Botanic Gardens, Calcutta	George King, M.D., LL.D., C.I.E., F.R.S., F.L.S.

Bombay, including Sind:—

Lecturer on Botany, College of Science, Poona	*G. Marshall Woodrow.

Madras: the State of Hyderabad and the State of Mysore:—

Government Botanist and Director of Cinchona Plantations	———

North-Western Provinces and Oudh; the **Punjab**; the **Central Provinces**; **Central India**; **Rajputana**; **North-West Frontier Expeditions**:—

Director of the Botanic Department Northern India, Saharanpur, N.W.P.	†J. F. Duthie, B.A., F.L.S.

Bengal.—Department of Royal Botanic Gardens:—

Calcutta (Seebpore)	Superintendent	George King, M.D., LL.D., C.I.E., F.R.S., F.L.S.
	Curator of Herbarium	David Prain, M.B., F.L.S., F.R.S.E.
	" Garden	*G. T. Lane.
	Assistant "	*H. J. Davies.
	Probationer	*George H. Cave.
Mungpoo	Superintendent, Government Cinchona Plantations	George King, M.D., LL.D., C.I.E., F.R.S., F.L.S.
	Deputy "	*J. A. Gammie.
	1st Assistant	*R. Pantling.
	2nd "	*Joseph Parkes.
	3rd "	G. A. Gammie.
	4th "	*Amos Hartless.

Darjeeling; Lloyd Botanic Garden:—

Curator	*William A. Kennedy.

Darbhangah; Maharajah's Garden:—

Superintendent	Herbert Thorn.

Bombay.—

Poona	———	———
	Lecturer on Botany	*G. Marshall Woodrow.

Ghorpuri.—Botanic Garden:—

Superintendent	A. R. Lester.

Bombay.—Municipal Garden:—

Superintendent	C. D. Mahaluxmivala.

Karachi.—Municipal Garden:—

Superintendent	*William Strachan.

Central Provinces.—

Nagpur - -	Superintendent of Public Gardens.	*J. Horne Stephen.

Madras.—Botanic Department:—

Ootacumund -	Government Botanist and Director of Government Gardens, Parks, and Cinchona Plantations -	———
	Curator of Gardens and Parks.	*Robert L. Proudlock.

Madras.—Agri-Horticultural Society:—

Hon. Secretary -	Dr. A. G. Bourne.
Superintendent -	*J. M. Gleeson.

Native States.—

Mysore (Bangalore)	Superintendent	- *J. Cameron, F.L.S.
	Curator -	-
Baroda - -	Superintendent	- *G. H. Krumbiegel.
Gwalior - -	"	- †C. Maries, F.L.S.
Morvi - -	"	- *Joseph Beck.
Travancore (Trivandrum)	"	- *Frederick James Ingleby.
Udaipur - -	"	- T. H. Storey.

North-West Provinces.—

Agra (Taj Garden)	Superintendent	- F. J. Bullen.
Allahabad -	"	- *J. Phillips.
Cawnpur -	"	- G. H. T. Mayer.
Kumaon (Ramghur)	"	- *F. W. Seers.
Lucknow -	"	- *Matthew Ridley.
Saharanpur and Branch Garden, Mussoorie.	"	- William Gollan.

Punjab.—

Lahore - -	Superintendent	- H. G. Hein.